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Major-General LORD ROKEBY, K.C.B., in the Chair.

THE MILITARY CHARACTER OF THE GREAT DUKE OF MARLBOROUGH.

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I HAVE chosen as my subject the Military Character of the great Duke of Marlborough, because I am led to believe that his genius is not by any means appreciated among his countrymen at its true value.

Within the limits of a single address, I can only propose to myself to direct your attention to a few of the events of his military career which bring out most prominently the distinctive characteristics of the man taken as a great military commander.

But he was equally great in politics as in war; and, indeed, no man can be a great commander without the possession of political as well as military genius—without that sagacious knowledge of men, personal ascendancy over their minds, far-reaching view, and unstinted confidence in his own powers, which placed Hannibal, Cæsar, Napoleon, Marlborough, and Wellington, with a few others, on a pinnacle apart.

My object at present is to show that Marlborough is worthily placed among the great men with whom I have associated him.

A very brief description of the general state of affairs in Europe, and of the composition of the contending parties, at the period under consideration, can hardly be dispensed with, because a very imperfect idea of Marlborough's labours, and of the difficulties he successfully surmounted, can be acquired from a consideration only of those operations which were under his nominal and immediate control.

In the year 1700, King Charles II. of Spain died at Madrid, having bequeathed the whole of his vast possessions to a grandson of Louis XIV., Philip of Anjou, who then assumed the title of Philip V. of Spain.

The principal continental powers acknowledged Philip V., excepting Austria.

The Elector of Bavaria not only acknowledged Philip's title to the crown of Spain, but entered into a cordial alliance with France; and being, at the time of the late King of Spain's death, governor of the Spanish Netherlands, the Elector secured for the young French prince the possession of that important country and of its numerous fortresses.

A glance at the map will show the commanding position which France thus acquired to coerce Europe, and how hopeless must have appeared at first sight the efforts of the coalition formed at a later period to curb the ambition of the French monarch,—of which the great Englishman was the animating soul, and by whose genius and patient fortitude alone the efforts of that coalition were brought to a successful termination.

France; Spain; Flanders; the greater part of Italy, comprising Savoy, Milan, Tuscany, and Naples; formed one close league in territorial connection with each other, and were, for all practical purposes, under the almost absolute direction of Louis XIV.

Thus Flanders, which had been the barrier of Europe against French ambition, became now an outwork of France for aggression against Europe.

In addition to the countries just enumerated, Bavaria formed an advanced post of immense advantage to France and danger to Austria, since it afforded a secure base from which the armies of Louis might threaten Vienna at the distance of only a few marches.

In 1701 Austria declared war against France, and sent an army into Italy under Prince Eugene, who at first obtained some success against the French forces.

In 1702 England and Holland joined Austria, and Marlborough, in his fifty-third year, was named Commander-in-Chief of the allied forces in Flanders. This appointment, combined with that of Ambassador-Extraordinary which he had previously held, and in virtue of which he had been the principal agent in organising the coalition, invested him with the supreme direction of civil and military affairs, so far as England was concerned, on the Continent.

The coalition was soon joined by many of the lesser German States, at a later period by Prussia and Denmark.

It was easy to foresee that the task of keeping together for any length of time a coalition of so many states, actuated by differing views of their individual interests, would be one of no common difficulty. And it may be said without exaggeration that their having been kept firm to the common cause was due to the personal qualities of Marlborough alone—to that ability, subtlety, knowledge of human nature, and personal influence due to his remarkable fascination of manner, which, added to his unsurpassed military genius, went to make up his grand and powerful character.

Besides the moral difficulties inherent in an alliance of so many states, the allies laboured under grave military disadvantages, their territories

being disjointed, and their several forces having to make long marches through neutral or hostile countries before they could unite. To produce a decisive effect they must strike at the heart of their enemy's power; but to reach France they must begin on the Rhine, with Holland as a base, and force their way through Flanders and through the barrier of fortresses with which the genius of Vauban had encircled the French frontiers.

Marlborough on more than one occasion, but particularly after the victory of Oudenarde, would, if unfettered, have marched on Paris, the road to which place seemed to be laid open by that victory. Had he done so, the experience of his whole military career, during which he never suffered a reverse, leads us to believe that he would have been successful; but he never could persuade the different members of the coalition that such a measure would be anything but the extreme of rashness; and even his worthy coadjutor Prince Eugene was startled at the boldness of the idea and objected to the risk.

At the commencement of the war the opposing forces were thus distributed:—

1. On the extreme French right Villars commanded an army on the Upper Rhine. Opposed to him was Prince Louis of Baden who commanded an Austrian army in the interest of the allies. His task was to maintain the lines of Stolhoffen which guarded one of the principal defiles through the Black Forest, as well as to defend the other entrances from the Rhine through the Black Forest, against the attempts of the French.

2. Next, Tallard with a French force of 13,000 was posted near Kayserwerth to interrupt the siege of that place, which was to be undertaken by a combined Dutch and German force under the Prince of Saarbruck.

3. Next, the principal French army under the Duke of Burgundy was on the Meuse covering Flanders. To this was opposed the principal allied force, at first under the Earl of Athlone, afterwards commanded by Marlborough in person.

4. On the extreme French left a French force under the Marquis de Bedmar was opposed to the Dutch General Cohorn.

5. The Elector of Bavaria in his own country commanded an army in the interest of France, which acted as a bridle upon Austria.

6. In Italy the combined forces of France and Savoy, under the nominal command of Victor Amadeus, Duke of Savoy, were opposed to an Austrian army commanded by Prince Eugene.

Marlborough's first difficulty was to overcome the jealousy of Athlone and the Prince of Saarbruck at his being appointed to the chief-command; and, although their unwilling acquiescence was at length obtained, he found rivals in place of obedient tools in his subordinate generals. By Athlone, in particular, he was constantly thwarted under an affectation of deference; and the remainder, where they did not purposely thwart him from jealousy, did so by their extreme caution and timidity. Next he found himself subject to be controlled in all his operations by the Dutch field-deputies, without whose consent he could undertake no offensive movement, although these men were, for the most part, entirely ignorant of military affairs. Imagine Napoleon controlled by civilian deputies and timid or jealous generals. What would have become of the Italian

campaigns, of Montenotte, Lodi, Arcola, Rivoli, Marengo?—what of Ulm and Austerlitz? But to these trammels Marlborough was subjected during the whole of his command. For a striking illustration of this, I refer you to his very first campaign as related by Coxe, the details of which I cannot attempt to give in the brief time at my disposal. You will find that immediately on joining the army in 1702 he submitted three different plans for the consideration of the Dutch states, without whose concurrence, as I have said, nothing could be undertaken. Although every moment was of value, fourteen precious days were wasted in deliberations. At length, when he did obtain permission to advance, the general in command of the Hanoverian contingent announced to him that his troops could not move without the orders of the Hanoverian minister at the Hague. On reference to that functionary, it was found that among the conditions on which he could alone sanction the march of the Hanoverians was this one, that they should not be led across the Meuse. Of this Marlborough said, "I think we were almost as well to be without them as agree to it, as if we have not these troops we shall not have strength to act."

A reference to the Elector of Hanover had no sooner removed this difficulty, when a similar one arose with the Prussian contingent, which had to be disposed of in like manner by an appeal to the King of Prussia.

In execution of the plan which had been sanctioned by the States, Marlborough crossed the Meuse below Grave and advanced into Brabant, so as, by threatening their communications with France, to compel the French to withdraw from their forward position between Goch and Gennep.

On the first intelligence of this movement the French quitted their position, and, making forced marches up the right bank of the Meuse, crossed that river between Venloo and Ruremonde and struck across country in order to regain their communications.

But on the 2nd of August Marlborough occupied such a position that the French must either await his advance in a camp which was so badly chosen that their defeat would have been almost certain, or must expose their right flank to be attacked by him while marching over an open heath.

The French quitted their camp at dusk and, marching all night, were just entering the heath at dawn. Marlborough's troops were under arms and ready to march; the defeat of the enemy was certain, when the Dutch deputies refused their consent to the attack they had sanctioned a few hours earlier, and the French army accomplished its flank march within sight of the allies, scatheless, but in such haste and confusion that the deputies confessed a great opportunity of destroying it had been lost through their means.

A very graphic account of this affair is to be found in General Kane's Memoirs, pp. 33 to 35.

Now let us consider for one moment what would have been the effect on the general issue of the struggle, if Marlborough's arm, when raised to strike the blow on this occasion for which he had so skilfully laid his plans, had not been held back by civilian deputies. In India these gentlemen are called "political agents."

From what has been said it must appear more than probable, that the defeat of the French army under the Duke of Burgundy in 1702 would have been not less complete than was that suffered in 1706 by the combined French and Bavarians, at Ramillies. The moral effect of such a victory at the very commencement of the war, would unquestionably have been greater than was that of the battle of Ramillies, occurring after four years of varying success.

But the effect of Ramillies in 1706, was to clear Flanders almost to the French frontier; to make a regular "*sauve qui peut*" of the French garrisons, many of which surrendered without a blow, nay, to make Louis tremble for Paris itself, the road to which capital seemed to be laid open, so much so that Vauban was ordered to prepare a plan for its defence.

By the first event of the first campaign in 1702, if Marlborough had had his own way, the first four years out of the ten which it lasted would have been struck from the war.

Yet Marlborough was assailed by his enemies with the slander that he purposely dragged on the war from year to year from the base motive of putting money in his purse.

A second opportunity about three weeks after the first, and yet a third which presented itself on the 13th October, of inflicting a disastrous defeat on the French army, was lost in a similar manner through the interference of the Dutch deputies.

Yet although no crushing blow was struck during this first campaign against the French army in the field, the capture of Venloo, Ruremonde, Stevenswaart, Maestricht, and Liège, all on the Meuse, and all effected between the 18th September and the 23rd October, gave to the allies command of the navigation of that important river, and a secure base from which to operate in the next campaign against the right flank of the general front of the enemy; at the same time that it attested the activity of the English commander and the surprising resources of his genius, which could effect such results notwithstanding the fetters in which it was compelled to work.

In other quarters where Marlborough did not command, that is, in Italy and Germany, the coalition met with reverses.

Early in 1703 Portugal joined the confederacy; and although this accession was of great value since it exposed the weakest part of the Spanish frontier to an attack by land, it added greatly to the difficulties and labours of the British commander.

At the time when his own plans in the Netherlands occupied so much of his attention, and their execution required the employment of a force which he had the utmost difficulty in providing, he was charged with the thankless task of endeavouring to obtain, for service in Portugal, troops from the Dutch, the emperor, and the German States, all unwilling parties, who could not be persuaded that their individual interests could be in any way advanced by sending a single soldier away from the protection of their own frontiers. Marlborough was finally obliged to supply a considerable detachment from the force in the Netherlands to complete the Portuguese expedition; and he was harassed by endless importunities in his choice of generals and officers for that expedition, as well as by the captious spirit of the Portuguese court.

During the campaign of 1703 in the Netherlands, Marlborough's plans, always conceived on a scale which the minds of his coadjutors were unable to appreciate—and particularly one grand scheme for forcing the French lines, and the capture of Antwerp and Ostend—were thwarted by the misconduct of some of the Dutch generals, by the interference of the deputies, and by the virulence of the factions at the Hague. The war, reduced to one of sieges, was marked this year only by the capture of Bonn, Sluys, and Limburg.

On the part of the French, the campaign of 1703 had been originally planned by the court of Versailles on a scale worthy of the "Grand Monarque," and of the vast resources which he directed with absolute authority.

While Villeroi engaged the whole attention of Marlborough in Flanders, a great combined effort was to be made in Germany against Vienna. For this purpose Marshal Villars was directed to march with the army of the Upper Rhine through the defiles of the Black Forest in one direction, while from another quarter the French army of Italy, leaving a small force to observe the Austrians in Lombardy, was to enter Germany through the defiles of the Tyrol; and these forces, after uniting with the army of the Elector of Bavaria, were then to pour in one resistless torrent on Vienna.

Accordingly Villars, having secured a passage over the Rhine by the capture of Kehl, led his army through the Black Forest and was joined at Duttlingen by the Elector of Bavaria, who returned westward for that purpose after having defeated and driven the Austrian troops beyond the Inn and the Danube, and reduced Neuburg and Ratisbon on the latter river.

After this junction it was agreed that Villars should observe the Imperialists on the Danube; while the Elector with 15,000 men should invade the Tyrol, to open the passes by which the French army of Italy under Vendome must march to join him. But the sturdy resistance of the Tyrolese peasantry saved the empire. Vendome, coming from Italy, could not penetrate beyond Trent; while the Elector, coming from Germany, was defeated in endeavouring to force the pass of the Brenner and driven out of the Tyrol with considerable loss.

This miscarriage, joined to the defection of the Duke of Savoy from the French interest, necessarily deferred the grand effort against Austria to the succeeding year.

We are now brought down to the year 1704, that of the ever famous and admirable campaign of Blenheim, which would itself, even though it had been his only one, have established the right of Marlborough to be classed among the military Titans of the human race.

The plan above described became known to the English general through his spies. He perceived that the enterprise, if successful, would trample Austria in the dust and shatter the confederacy to pieces.

It is indeed difficult to conceive a more gloomy prospect than that with which the year 1704 opened on Marlborough, who alone with Prince Eugene appreciated the magnitude of the crisis.

Austria was in imminent danger. With a formidable insurrection existing in Hungary in the rear, where the rebels had gained considerable successes against the imperialist troops—threatened at the same time with

an overwhelming irruption of enemies in front—the defensive system of Austria was in a deplorable condition.

Every exertion had been made to raise levies and prepare Vienna for a siege; but with an impoverished country and an exhausted treasury every exertion was fruitless.

The Elector of Bavaria commanded the Danube from its source to the frontier of Austria. He occupied Ulm, Neuburg, Ratisbon, Passau, and Lintz, all on that river. His force was raised by the junction with Villars to 45,000 men, and it was to be feared that Marshal Tallard—whose army on the Upper Rhine had likewise been raised to 45,000 men, and who had lately reduced Landau and Old Brisach, which last gave him a passage over the Rhine—would march to join the Elector through the southern passes of the Black Forest, which were weakly guarded by twelve Dutch battalions stationed at Rothweil, aided by some militia and peasantry.

The force which the Emperor could oppose to the Elector barely amounted to 20,000 men, while the main army of the empire under Prince Louis of Baden guarded the lines of Stollhoffen, near Carlsruhe, which had been constructed to defend the entrance to the northern defiles of the Black Forest.

Besides these, a few scattered battalions of Hessians and Prussians were in the neighbourhood of Philipsbourg. It seemed scarcely possible to prevent Tallard from joining the Elector in Bavaria, and from operating on Vienna with 90,000 men.

Marlborough saw clearly that the fate of the confederacy must be decided in Germany; he therefore formed the bold design of entrusting the protection of Holland and of his conquests in Flanders to the Dutch alone, and, leaving in his rear the numerous fortresses and armies of the enemy, of hastening with every man, horse, and gun he could collect to the decisive point. His plan was to transport his army by forced marches from the Netherlands into Bavaria, and there—having united with Eugene, and having gathered up in his advance all the small detachments of the confederates—to overwhelm the Elector of Bavaria before he could be reinforced by Tallard's army from the Rhine.

But both the moral and physical difficulties to be surmounted in the execution of this scheme were of so grave a nature, that any mind but one cast in the very grandest mould, would have shrunk appalled from the prospect they presented. His first care must be to baffle the penetration alike of friends and enemies, as both were almost equally dangerous to the success of his project.

For his enemies, had they learned his intention, might easily have frustrated it by a vigorous effort. He must give the slip to Villeroi in the Netherlands, and to Tallard on the Rhine, the latter of whom would have intercepted his march, and the former would have hung on his skirts, had they been aware of his destination, while the consent of the Dutch as well as of his own government would certainly have been withheld, had their timidity been startled by the disclosure at once of the whole of his intended enterprise; he must therefore lead them on by degrees, and deceive them into a concurrence with his first measures, until they should find themselves too far committed to recede.

The first condition of success therefore was absolute secrecy as to his

real plan, which was shared between himself and Prince Eugene alone. He persuaded the English government to forward his views without disclosing their extent, to send 10,000 additional troops to the Netherlands, and to give subsidies to Portugal and Savoy, to enable them to maintain the struggle.

With the Dutch he had more difficulty. He repaired to the Hague, where he laid before the government a plan skilfully calculated at once to conceal and to promote his design, of taking the offensive vigorously on the Moselle with his own army, while the Dutch, under Overkirk, remained on the defensive in the Netherlands.

The consent of the States even to this plan was only extorted at length by Marlborough's declaring it to be his fixed resolve to carry off the English force to the Moselle without the Dutch auxiliaries, if they persisted in their refusal. Next he had to persuade them to furnish a sum of money to enable the Margrave of Baden to keep the field.

He next had to deal with the King of Prussia, a most exacting and troublesome ally. Marlborough flattered this prince so adroitly by affecting to make him a confidential communication of his plans, even to the length of specifying the intended disposition of his troops on the Moselle, and by addressing him as the deliverer of the empire, that he obtained from him a considerable increase of the Prussian contingent.

By these efforts he succeeded in raising the army which Prince Louis of Baden commanded at Stollhoffen to 30,000 men, and, having also provided for the defence of his conquests in the Netherlands, on the 19th of May he commenced his memorable march towards the Moselle. At his very first halting-place, on the 20th, he received expresses from Overkirk in one direction, and from Prince Louis at Stollhoffen in another. Overkirk begged him to halt because Villeroi had made a forward threatening movement. Prince Louis urged his joining *him* at Stollhoffen because Tallard threatened to cross the Rhine.

To satisfy Overkirk he halted for one day, while, to reassure Prince Louis, he directed the Prussian troops on the Rhine to move towards Philipsbourg as if to reinforce him, but with secret orders not to proceed beyond a certain distance.

On the 23rd at Bonn he had the vexation to learn that Tallard, having crossed the Rhine at Brisach, had succeeded in pushing a reinforcement of 10,000 men through the Black Forest to the Elector of Bavaria, and had then taken post near Strasbourg. He heard also that Villeroi from the Meuse was hastening after him to the Moselle.

Having crossed the Rhine at Coblentz, he reached Mentz on the 29th. He here disclosed his design to the Prince of Hesse, and persuaded him to send the battering-train he had collected at Mentz for the expected operations on the Moselle up the Rhine to Mannheim, as if now for the purpose of besieging Landau.

Hitherto his movements had held Europe in expectation, suspended the operations of the Elector of Bavaria, and perplexed the French commanders. His advance beyond the Moselle seemed to threaten the invasion of Alsace, while the despatch of the Hessian battering-train to Mannheim would appear to indicate the siege of Landau.

Villeroi, coming from the Meuse, accordingly directed his march towards Landau, and Tallard moved northward to join him.

Having thus set these two dangerous opponents on a wrong scent and secured a considerable start, the army which Prince Louis had commanded was left to watch them on the Rhine under the command of Prince Eugene, to prevent them, if possible, from crossing that river and reinforcing the Elector of Bavaria.

Marlborough was very anxious to have Eugene as his immediate colleague on the Danube; but the Prince of Baden, insisting on his superior rank, was transferred to what he considered the more important command, and it was with difficulty he could be brought to consent to share the chief command with the English general. It was finally settled that they should exercise the command on alternate days; thus Marlborough found himself saddled with a captious and incapable colleague.

Proceeding onwards from Mentz, Marlborough crossed the Neckar twice at Ladenburg and Lauffen, on the 3rd and 9th of June.

He had no sooner done so than his design burst at once on the minds of his astonished enemies.

On the 21st his whole army cleared the defile of Geislingen, and on the 22nd united with the 20,000 men whom Eugene had previously commanded.

On the 24th the Allies advanced to Langenau and Elchingen. The Elector of Bavaria, who was at Ulm, withdrew to his entrenched camp at Dillingen. Marlborough's object being to strike at Bavaria, and by wasting his country to compel the Elector to abandon the French alliance.

On the 1st July the Allies passed within sight of the Electoral camp, and halted that night at a distance of fourteen miles from Donauwerth. This place was defended by 12,500 Bavarians who occupied the commanding heights of the Schellenberg, where they laboured night and day to strengthen the entrenchments.

On the 2nd it was Marlborough's turn to command. He was resolved to gain Donauwerth at any price as a place of arms for his intended invasion of Bavaria, and he determined to attack the Schellenberg that very day, notwithstanding that the intervening roads were heavy with continued rains and the army was encumbered with a long train of artillery, because he felt sure that if he failed to do so on the 2nd, the 3rd would be wasted by Prince Louis in irresolution, and that the delay of twenty-four hours would enable the enemy to complete his works and to receive reinforcements, in which case he said that the delay of every hour would cost the loss of 1,000 additional men in the assault.

The result is known. Although unable to bring up his men till 4 P.M. he assaulted Schellenberg at that late hour, carried it after a desperate conflict, in which 8 generals, 11 colonels, and 1,500 of other ranks were killed, and 4,000 wounded.

The Elector, who crossed the Danube at Dillingen and marched by the south bank to the relief of his garrison, was only in time to witness their defeat, and withdrew to Augsburg, leaving his dominions at the mercy of his enemies.

On the 10th of July the allies, having crossed the Lech at Gunderkingen, entered Bavaria.

On the 18th the army occupied Aicha, but Marlborough's design of besieging Munich was prevented by the failure of Prince Louis to provide

a battering-train as he had promised to do. 3,000 cavalry were, however, sent on to burn and destroy to the very gates of the capital; a barbarous proceeding, adopted for the purpose of forcing the Elector to make terms.

Meanwhile Tallard had crossed the Rhine with 35,000 men, and, eluding Eugene, joined the Elector of Bavaria on the 5th August.

Eugene, marching from the Rhine in a parallel direction, arrived at Hochstett at the same time with 18,000 men, having left 12,000 to watch Villeroi.

Prince Louis of Baden was now persuaded to undertake the siege of Ingolstadt, and was detached on that service with 20,000 men.

There was now a danger lest the enemy, being very superior in force to either Marlborough or Eugene singly, might beat them in detail.

On 9th August, it being ascertained that the Elector and Tallard were in full march from Augsburg to Dillingen, in the evident design of there crossing the Danube and overwhelming Eugene's 18,000 men at Hochstett, arrangements were made for a concentration in front of Donauwerth. Eugene's army fell back behind the Kessel river, where it was joined by that of Marlborough on the night of the 11th.

On the 13th Marlborough and Eugene attacked and defeated the Elector and Tallard at Blenheim, and thus terminated this brilliant campaign, which appears to me to be one of the very grandest military achievements on record.

No similar instance exists in history of a mere general, answerable to his own sovereign and to his allies, taking on himself such an immense responsibility. Alexander and Napoleon, for the prosecution of their great projects, wielded absolute power. Hannibal, though opposed by a faction at Carthage, was absolute in Italy. But what Marlborough did was in direct contravention of the authority under which he acted; and it was only in conquering their enemies that he conquered the approval of his employers.

Historians relate with wonder how Napoleon, on the 1st September, broke up his camp on the heights of Boulogne, set in motion eight corps by various routes to the Danube, and terminated a campaign of one hundred days with the crowning victory of Austerlitz.

Napoleon's march was of his own troops, whom a nod from him sufficed to move. That of Marlborough was the march of allies tricked by degrees into carrying out a plan with the secret of which they were not entrusted, coming from various quarters, with orders from different sovereigns; the command divided on alternate days with an incapable colleague; and yet, in the course of less than a hundred days, Marlborough, too, had transported the confederate troops from the Meuse to the Danube, routed the allied French and Bavarians at Blenheim with the loss of 40,000 men, conquered Bavaria, dethroned the Elector, and saved the empire from destruction.

In making war there is one great principle or rule, and only one, which is of universal and arbitrary application, viz. that you must be superior in force to your enemy at the decisive point and time; or, where actual circumstances render that an impossibility, then it is required to bring up to the decisive point every man, horse, and gun that can by any possible foresight and combination be arrayed there.

Other rules there are with respect to the manner of applying the first, having reference to the preservation of your own communications, and to the intercepting those of your enemy, besides many maxims which are all subject to modification by actual circumstances, and particularly by moral considerations.

But the genius of a great captain is a law to itself. He takes counsel of his own inspiration alone, and, unfettered by arbitrary rules, he keeps his eye fixed on the object of all operations—success—and presses on to the goal, sensible that no course of action can be at variance with military principles which lead him to it.

Marlborough's comprehensive view embraced Europe as one vast battle-field, of which he saw that Bavaria was the decisive point; casting off all communication with his base, like Hannibal in his invasion of Italy, he threw himself into the midst of enemies, relying on his own genius to organise a secure base of operations in a hostile country; and this he accomplished.

His military genius was peculiarly that of a strategist in the literal meaning of the term; and he employed on the contracted theatre of a field of battle precisely the same weapons of finesse, masterly combination and skilful execution, which win our admiration in his great strategical operations.

He appeared to deal with the minds of his opponents at will—to command them to believe what he desired them to believe—and having, by the subtlety of his art, led them to weaken the point which he perceived by intuition to be the decisive point of the field, he then directed his battalions and squadrons on that point with irresistible force and ability.

At Blenheim, by a feigned attack on the village of that name, Marlborough induced Tallard to draw nearly the whole of his infantry from the centre, and to shut it up uselessly in the village, so that the attack which Marlborough prepared against the centre was successful and decisive.

He was not content with mere victory; his measures were always taken with a view to inflict the greatest loss possible on his opponents. At Blenheim, by breaking the centre, he cut off nearly the whole of Tallard's right wing from the only road by which it could retreat. 11,000 prisoners were taken in Blenheim alone; Tallard himself was captured, and the total loss sustained by the French and Bavarians in the battle and subsequent retreat, is computed at 40,000 men and 47 guns; a loss greater than any which France ever after sustained until Waterloo.

At Ramillies the Tomb of Ottomond on the French right was the point which Marlborough's eye marked as decisive. To induce Villeroi to weaken that point he ordered a feigned attack on the French left. A marshy stream, difficult to cross, separated the French left from Marlborough's right which was posted on high ground that sloped both ways, viz., down to the stream in his front as well as to the rear of his line. Marlborough's infantry of the right wing in two lines, supported by cavalry, marched down the slope towards the stream as if about to cross. Villeroi, alarmed for his left, reinforced it by a considerable body of infantry from his right. Marlborough waited till the enemy's movement was nearly completed, and then ordered his right to retire to the elevation

it had quitted. With his first line he halted on the crest and showed front to the enemy, but he carried his second line over the height to the rear, and moved it rapidly, concealed by the nature of the ground, to his left. He thus strengthened his attacking force at the same time that he induced Villeroi to weaken the point he was about to attack; and the victory was principally owing to this circumstance.

The time will only admit of my directing your attention to one other operation, which is a wonderful instance of the power which the English general wielded over the minds of his opponents. I allude to the passage of the French lines of Bouchain in 1711. The details will be found well related in Coxe.

Marlborough selected as the point where the passage of the lines might be most easily effected, one which was defended by an important fortified post named Arleux, on Marlborough's side of the lines. This post was held by the French, and he therefore resolved to take it ; but for the success of his general plan it was not enough that he should capture this fort, because if he should do so, and either retain it or demolish it himself, the attention of Villars the French general would be drawn to the point, and he might so guard this part of the lines, which was very strong, that success by main force would be hopeless.

Marlborough must if possible not only divert the attention of Villars from the neighbourhood of Arleux, but he must induce that marshal to demolish the defences of the post himself. To effect this, which seemed difficult enough, the duke had recourse to the following masterly stratagem. He assaulted and took Arleux, to show Villars he could capture it when he pleased; he then considerably enlarged and strengthened its works to delude Villars into the belief that he valued it as a defensive post.

Having so done he left Arleux and its garrison to its fate, and carried his army to a distant part of the lines which he ostentatiously threatened to attack, feeling confident that Villars would then retake Arleux, and, finding it on account of its increased extent to require a larger garrison than he could safely spare from the defence of that portion of the lines menaced by Marlborough, that the French marshal would then demolish a post which his adversary seemed to value.

It happened according to Marlborough's calculations. Arleux was attacked and captured by the French, with its whole garrison. Villars was greatly elated, while the English general pretended the deepest mortification. He shut himself up in his tent, with exquisite dissimulation changed his usual courteous demeanour and became morose, and declared to all who had access to him that he would repair the disgrace he had sustained in the loss of Arleux, by attacking the enemy's entrenchments in his front at all hazards.

He soon had the satisfaction of learning that Villars had evacuated Arleux and demolished its defences, and, leaving that portion of the lines destitute of troops, that he had concentrated his whole force behind the part menaced by Marlborough.

To confirm Villars in his error, Marlborough, attended by his generals, made an elaborate reconnaissance of the enemy's position in full view of the French army. He rode along the front within cannon shot; stopping occasionally, and pointing to different parts of the entrenchments, he care-

fully explained to his generals the direction their several columns should take in advancing to the attack.

Having thus completely deceived both friends and foes, and effectually prevented the possibility of his real design being communicated to Villars by confiding it to no one, he gave orders for the troops to form for the assault of the lines at tattoo that evening, and intimated to the officers in command of the separate columns that they were only to move off under the guidance of staff officers who would be sent for that purpose.

The army was formed accordingly at tattoo beating in columns of attack; but, instead of advancing, they filed off to the left, the attention of the French general being occupied by a demonstration made by the light cavalry in front of his left.

Marching all night, Marlborough, at eleven o'clock on the following morning, passed the lines unopposed near the ruined fort of Arleux with a considerable body of cavalry and infantry.

Before dark the same evening his whole army occupied a strong defensive position on the French side of the lines; and this celebrated barrier, which Villars in writing to his sovereign had called the "ne plus ultra" of the English general, was broken through without the loss of a man.

Like most great generals Marlborough invariably took the initiative, and compelled his adversary to follow it, and no commander has ever been more enterprising.

His care in providing for the comfort of his troops was unceasing, and he was, in the words of Mother Ross, a famous camp follower, whose adventures were written by Defoe under the name of Mrs. Christian Davies, "entirely beloved by all the forces, not only for his courage and conduct, but equally dear to us all for his affability and humanity."

In estimating the greatness of Marlborough, we ought to take into account the age at which he first commanded an army in the field and his physical infirmities.

It is strange to observe how late in life the great work for which they have been born comes to some men.

If Wellington had died at thirty-four he would still have left a lasting name in the history of British India. At forty-five he had swept eight French marshals out of Spain, and broken the last hope of Napoleon at Waterloo; but if Marlborough had died at fifty, he would scarcely have furnished a paragraph for the most voluminous history that ever was written. His great deeds were done, his great name earned, when falling into the sere and yellow leaf; when his strong frame was beginning to fail; when, as he himself writes, "My eyes are so bad I do not see what I do;" and when "I am habitually mad with headache." In another place he says, "I am troubled with cold fits of ague, and with gout." And again, "I have become so lean, that, if not well nursed in the winter, I shall certainly be in a consumption."

Yet, with these ailments, he contrived to be seventeen hours on horseback at a time when, he writes, "If I were in London I should be in bed in a high fever."

Then we see him at the age of fifty-eight at the siege of Lille, doing the double duty of commanding Eugene's army as well as his own, and before Ghent in a Flemish fog at Christmas, paddling in the wet trenches, and

earning so great a cold that he says, "It is very distressing to me to hold down my head."

All this and moreover at the same time to manage Dutch, Prussians, jealous subordinates, political agents, kings, queens, and emperors, English Whigs and English Tories, and, hardest task of all perhaps, the Duchess of Marlborough, was, it will be admitted, no child's play.

To sum up his military achievements; in twenty campaigns—ten of which were successive—he passed all the rivers and lines he attempted, took every town he invested, won all the battles he fought, and was never surprised by the enemy.

I may fitly conclude with a quotation from Addison's poem, "The Campaign." The particular lines were inspired by Marlborough's personal demeanour at Blenheim.

'Twas then great Marlborough's mighty soul was proved,
That, in the shock of charging hosts unmoved,
Amidst confusion, terror, and despair,
Examined all the dreadful scenes of war.
In peaceful thought the field of death surveyed,
To fainting squadrons sent the timely aid,
Inspired repulsed battalions to engage,
And taught the doubtful battle where to rage.
So when some angel by Divine command
With rising tempests shakes a guilty land,
Such as of late o'er pale Britannia passed,
Calm and unmoved he drives the furious blast,
And, pleased the Almighty's orders to perform,
Rides in the whirlwind and directs the storm.

Friday, April 8th, 1859.

Captain E. G. FISHBOURNE, R.N. C.B., in the Chair.

NEW ZEALAND CONSIDERED AS A FIELD FOR THE EMIGRATION OF MILITARY MEN.

By Captain C. CHESNEY, R.E., Professor of History at the R. M. College, Sandhurst.

I DO not purpose to occupy your time with a lengthened apology for the subject which I have undertaken to bring to your notice. So large a number of the better class of emigrants is drawn from among the officers of the army, and of this number there are so few who decide on their future home without at least some thoughts of New Zealand, that I trust a brief account of that colony, its advantages and disadvantages to the intending settler, may not be deemed inappropriate to the lecture-room of this Institution. There are, indeed, a variety of printed works on this very subject; but there are, I am sorry to add, only a few of them which have not been published from interested motives, and I have met with none that, in my opinion, fairly puts before the reader the whole difficulties which he should be prepared to meet.

I should here explain that the value of land, cattle, and all such property, in a newly-settled country, rises naturally in a regular ratio with the increase of its population: each new arrival from the mother country adds a fractional increase to the selling price which the earlier settler can obtain for his farming stock, land, or house. Hence there is a constant inducement to the production of books, the object of which is to draw as many people as possible to the colonies they describe, and which in fact are no more to be relied upon than any other of that large class of advertisements called "puffs."

In the account I am about to give, I shall strive to tell the simple truth, without partiality or concealment, believing, as I do, that the claims of New Zealand to popularity as a colony require no factitious aid from tongue or pen, and that her real natural advantages are sufficient guarantees for her future growth and greatness.

The subject before us seems naturally to divide itself into the following heads:—

1. The consideration of the colony as a whole, and in comparison with the other important members of our colonial system.

2. A special account of all of the provinces, such as may be useful to those who are anxious to become acquainted with the local peculiarities of each.

3. Remarks applicable to persons who may seriously entertain the thoughts of leaving England to seek a home in New Zealand.

Let me now proceed to the first section of our inquiry.

New Zealand lies, as you are aware, not very far from the point on the

globe called the Antipodes of Great Britain, to which island it bears in some respects a considerable resemblance, running, as it does, in its main direction, from north to south, and thus occupying a considerable space of latitude, which produces a corresponding difference of climate between its two extremities. The acreage, or area, of New Zealand is remarkably near that of our own island; indeed, it remains for some more accurate survey than those existing to be made, before we can ascertain whether it is a little more or less than that of Great Britain: at present we only know that it is the same within a million or two of acres. The resemblance between the two countries has been considerably exaggerated, and I think its chief points are the two just mentioned.

And now to speak of the differences between them.

New Zealand lies much nearer to the equator than our own island, its northernmost point being nearly in lat. 34° S., whilst the southernmost is in lat. 47, instead of its extending from 50° to 59° N., as does Great Britain; its centre is therefore about 850 miles nearer to the sun than that of the latter. I need hardly add that the climate is therefore warmer; but I believe very few people at home are aware how great the difference is, and I may state at once that the north of New Zealand possesses (I do not say enjoys, for that must ever be a matter of taste) a climate warmer than that of Naples. The summer is very hot indeed, the heat being quite tropical, and in some years unbroken for four or five months by a single refreshing shower. The winter is very mild, and is chiefly diversified by violent storms of wind and rain seldom continuing more than twenty-four hours; or by a few days of really cool weather, when the wind sets in from a point due south, and, being accompanied by a cloudless sky, produces an elastic bracing feeling of cheerful health and strength, which I doubt if any climate can surpass, or even equal. I have not been in the most southern settlements of the island, but, although both winter and summer there are much more like those of England, the furthest point as yet attained, which is nearly at the extremity, has not brought the colonists into a climate as cool as even the very warmest parts of the south shore of Devonshire.

New Zealand is much more completely surrounded by open ocean than Great Britain. It results from this, that it is free from that great difference of moisture between the winds from different quarters, which is so severely felt by all invalids at home. The easterly winds more generally bring rain to New Zealand than the westerly, for in that hemisphere most of the ordinary conditions of nature with us are reversed; but there is no perceptible, much less painful, difference in the feelings produced by either.

New Zealand is not one island, as most persons know, and the map shows; it is divided, just in the centre, by the narrow slip of water called Cook's Straits, which in one place is only seven miles wide. The very stormy nature of this passage renders it a much more important division than would at first sight appear, and makes it a considerable barrier to communication from the northern half (or Northern Island) to the southern portion, which is commonly called Middle Island, from there being to the south of it, again, the third insignificant division, named Stewart's Island.

It has been said that the area of New Zealand is very nearly equal to that of Great Britain, but it would be a great mistake to conclude from this that the extent of cultivable land in the former is the same as that in the latter. The fact is far otherwise. The northern island contains, especially towards the Cook's Straits extremity, great chains of mountains, which are never likely to be inhabited in a newly-peopled country, where there is a choice of more favourable localities. And this is far more the case in the middle island, where the whole western and northern portions are occupied by snow-covered ranges perfectly alpine in their character, and which, though they leave fine plains to the east, yet take up a very large part of the space which the island covers. Indeed New Zealand, generally speaking, is of a more mountainous character than any country I am acquainted with, except Switzerland, and there is no probability that it could at any period support an agricultural population at all equal to that maintained by Great Britain.

Another distinction in the features of these two countries is to be found in the superiority of New Zealand as to its supply of water. Throughout the country the number and size of the streams is remarkable, even in those parts which are not of an elevated character; whilst the noble navigable rivers which more markedly intersect it, and are fed by the snows and rains of the mountain ranges just referred to, are matter of admiration to every traveller, and also of wonder, as compared to the moderate extent of the land which they traverse. A further increase to the present scattered population will lead assuredly, among other internal improvements, to a great development of the natural resources thus bountifully supplied for inland communication.

From the subject of rivers there is a natural step to that of harbours, and, with regard to the latter, which are of course a necessity in the foundation of new settlements, no country has been more favourably dealt with than that we are speaking of. There are but few portions of the coast which are not richly supplied in this respect. In speaking of the provinces I shall have occasion to refer to some of the principal harbours, and I may mention generally that there are many others, more or less frequented, which are so favourably placed as to give sure promise of their future value, as settlements become multiplied.

And now to speak of that point, which should surely be the first attended to by those who wish to know whether a colony is suitable as a residence for themselves or others in whom they are interested, viz. the climate. Its degrees of heat and cold have been already spoken of in a general way, but the question remains, What is its practical effect upon the race who are now peopling it so rapidly? Now the assertion has been often made that it is finer than that of England, and it has been supported by statistics of the amount of cases of disease and death occurring at certain of the settlements. If this be intended to mean that the majority of emigrants will find it more suitable to their constitutions than that in which they were brought up, I believe it to be a most decided fallacy, and founded on an erroneous basis. Such statistics, made in the infancy of any colony, are most unreliable. The fact of the population of both sexes being mostly composed of persons in youth, or in the prime of life, the absence of those epidemic diseases which cause so much mortality at

home, but do not find their way across the ocean for years after the foundation of the new settlements; the healthy open-air life which agricultural and pastoral pursuits enforce; these causes are quite sufficient to produce a mistaken belief in the supposed superiority of the newly-tried climate, and, such an error once arisen, those who have cast their lot in it are naturally very unwilling to abandon their delusion.

The fact is that most Englishmen find the air of New Zealand much more warm and enervating than they supposed; and it is, like all other similar climates, less suited to their constitutions than the rougher and more bracing atmosphere of their native land. I should except, however, from this view, those who cannot bear the cold of an English winter, or the varying temperature of an English spring; and particularly the large class of sufferers from a tendency to pulmonary complaints. Such persons would, undoubtedly, in most instances, gain in health by a removal to New Zealand. So also would many, who could exchange a sedentary life at home for a farm or sheep-run in the colony.

Another matter which much concerns those who are about to make their future home in a distant land, is the quality of the individuals with whom they will have to mix. Now it is certain, though the truth may not be a palatable one, that in none of our newly-settled countries is there to be found so high a standard of morality as might be desired. The rapid acquisition of property seems to make men all the less scrupulous as to the means they employ for this end: and much of the deficiency now spoken of is also to be ascribed to the absence of the constant restraint, which the state of society at home imperceptibly imposes on each of its members. From this last cause doubtless it is that the vice of intoxication forms a glaring and painful feature among colonial habits in each of the new Anglo-Saxon communities. Now it cannot be asserted that New Zealand is an exception to the evils just mentioned. And yet it may be safely said that there are more settlers of a superior class and a right tone of mind in her settlements to counteract them, than can be found in any other of our colonies. The influence of these men on the habits of the generation rising around them, and its importance to the future moral and religious welfare of the country of their adoption, cannot be overrated. Nevertheless, even in New Zealand, drunkenness prevails to such an alarming extent that those who carry with them in their emigration the tendency to that most fatal vice, may be said to go to certain misery, ruin, and probably an early death.

Of the soil and farming capabilities of the country, I shall have occasion to speak more particularly in my account of the different provinces. The valleys and plains are almost without exception fertile; the heavy timber of the north, and the rich natural pasture of the centre and south, both alike attest this fact, and offer their several inducements to the axe and plough. The forests of Taranaki and the grassy plains of Canterbury are alike capable of affording rich repayment to continuous and rightly-directed labour. Having said thus much, I would caution my hearers against putting faith in the exaggerated eulogiums published, which in this instance also have gone far beyond the truth, and would make it appear that the very exceptional cases of sixty bushels of wheat being produced from, or five sheep maintained by, one acre, were the rule by which the settler might make his calculations.

When we approach the subject of the scenery of New Zealand, we touch upon a point in which she compares most favourably not only with Great Britain but with almost any other land that the sun shines on. If the most varied combinations of streamlet and valley, hill and wood, of snow-capped mountain and noble river, with bright blue sky over all, can charm the eye and thrill the heart, there is no country where this simple pleasure may be more completely enjoyed. The forest heights which rise from the fair plains of Taranaki, crowned by the mighty cone of Mount Egmont, piercing the skies; the huge mountain ranges which seem to bar in the Bay of Nelson and Queen Charlotte's Sound from landward approach; the picturesque green hills which surround Wellington and her harbour; these, and many other such views, can never be forgotten by the soul that has once been filled with their beauties. Were New Zealand within such a distance as to make it accessible to tourists, the more adventurous class would soon discover that, both in point of lovely scenery and of natural curiosities, there are but few parts of the world so well worth a visit.

As to animal productions, a by no means unimportant matter to the sportsman who enters a new field, New Zealand does not hold out rich promise. When Cook first visited its shores there was no quadruped in the island except a very small rat, now supposed to have been exterminated by its stronger European cousin. The pigs which he first imported have increased largely, and form a great article of food with the native population, and also supply some fair wild-boar shooting (for riding through a New Zealand forest is out of the question) in those parts where there is no native tribe near to lay claim to the remains of the quarry; in the neighbourhood of their pahs (or villages), however, it would be a most useless and expensive amusement to slay a stray grunter. Having mentioned this, and that there are abundance of wild fowl on the rivers, wherever they are left unmolested, and a few quail in some of the more open country to the south of Cook's Straits, I fear I have exhausted the list of sporting resources. One hears of pigeon-shooting; but this should rather be called pigeon-killing, for the woodpigeons of New Zealand are in the habit of gormandising during the seasons of particular berries till they become nearly incapable of movement, and the fortunate individual who discovers a flight of them among the thick branches of the forest—and to do so is no easy task, so dense is the foliage—may frequently fire several shots, and bring down his particular bird each time, before the rest make up their minds not to be killed, and leave the scene of their repast.

There is no animal in the colony to correspond to our deer, hare, or rabbit; nor any bird of the grouse, partridge, or pheasant kind. An enterprising individual has lately imported a number of the latter species into a rather out-of-the-way part of Auckland, where they were tolerably undisturbed, and the result, in a very few years, has been so vast an increase as to show that the climate and vegetable food proper for them are there already, and it only remains for man to supply the deficiency of nature in this respect. So with the rivers. It is very hard for the traveller who looks on those numerous streams which intersect the island in every direction, and give fresh beauty to each turn of every valley, to

believe that their waters are nearly destitute of fish—yet so it is. Eels in abundance, and a very small, sluggish species of trout, which does not rise to the fly, are all that they yield to piscatorial research. The man who could succeed in conveying the spawn of the salmon and the trout uninjured to the rivers of New Zealand, would confer a most weighty benefit on the future generations of its inhabitants.

Most of my auditory are aware of the leading characteristics of the native race of New Zealand, called there always by their own name of Maori; but the popular idea of them in England represents rather their past than their present condition. I saw, only a few days since, an elementary book upon geography, very recently published, in which they were spoken of as a race of cannibals. Now the last act of such a nature as could cast this stigma on them occurred seventeen years ago, and, so far from there being prospect of its being ever revived, I was present at an internecine warfare of two of the tribes in 1855, when the wounded and slain on each side were allowed to be removed by their friends during a sort of armistice made for the purpose, and were taken away accordingly without more approach to insult or mutilation than Frenchmen would receive under similar circumstances at the hands of Englishmen. The number of Maories has been variously estimated at different times within the last few years as being between 80,000 and 50,000. It is probable that the last estimate is the safest, and more particularly so now, as within the last few years various European epidemics, imported by emigrants, have made fearful havoc among them. They get the measles or influenza, but will not submit, even where there is advice for them, to the necessary care and treatment, and so perish wholesale. It is painful to pass through their villages and observe how very few children there are in proportion to the number of adults. Owing to this cause, and also to the fact that the mixture of the two races on the borders of the European settlement seems, for some cause or other, to be very unfavourable to an increase of population, there is, it is to be feared, a steady diminution of this noble race in progress, which threatens before long to annihilate them altogether. It is not in any way owing to any want of inclination or power on their part to adapt themselves to the habits of civilisation; on the contrary, they wear the clothes, raise the food, and use the tools, ply the machines, and navigate the vessels of the white man, and have adopted his religion, and the higher morality it induces, so honestly, that, as average Christians, they may well bear comparison with any community of Europeans. Even the greatest difficulty in the way of their complete civilisation, their custom of holding food and all such products to be not an individual property, but common to all the tribe of the possessor, even this is waning year by year, supported though it be by all the force of national habit, and by the influence of all who would indulge their personal indolence.

The Maories are large producers of corn, potatoes, &c. on their own land. They also add considerably to the supply of labour in the northern island, which is their chief abode, by their readiness to undertake odd jobs for the settlers. This desultory mode of working suits their habits well; but they have not as yet become trained to systematic labour, and cannot be induced to follow continuous employment as farm labourers or house servants. They use and rear with success all sorts of domestic

animals, and are passionate lovers of horses. Of these they now breed as well as import many, and, as they ride recklessly up and down the slopes of their native hills and ravines, they promise to become almost as equestrian a nation as the mountaineers of Circassia. I must not trust myself to speak further of this interesting people, of whom I believe most inquirers rightly assert that they are far superior to any of the aboriginal races we have encountered elsewhere. In concluding this notice of them, your attention should be drawn to the fact that they are all, with the exception of a few hundreds, located in the northern island, a great portion of which is recognised as their property, whilst they have no claim of importance over any part of the lands in the middle island. This circumstance has, as you will presently see, a powerful influence on the prosperity of certain of the settlements.

To return to the general subject. We have been speaking hitherto chiefly of the differences between Great Britain and her young daughter in the Antipodes, but this part of our subject would be very incomplete if we did not endeavour to make some comparison between the latter and those other great colonies which attract the attention of the emigrant. I really believe that with the exception of her greater distance from the mother country, and the want of game for sporting, there is scarcely a point in which New Zealand does not contrast with advantage. Consider but for a few moments the climate of New Zealand, where an open-air working life may be carried on with advantage to the health as well as to the farm from year's end to year's end; where the settler can turn out sheep, cattle, or horses, to feed untended, without shelter, in winter or summer, undeterred by frost, heat, drought, or fear of too great humidity; where every valley has its stream for use and ornament; where there is no snake or reptile, or beast of prey of any sort, to be feared or guarded against. And then compare it with Canada, and her five months of winter frost, stopping every attempt at farming operations; or Australia and her torrid riverless plains, burnt up by a sun as fierce though not as deadly as that of India; or the dry wastes of the Cape, with their innumerable poisonous reptiles and fierce wild beasts; and we must decide at once that there is no colony which offers the same advantages to the steady, quiet settler who goes out predetermined to win by his labour a peaceable and smiling home in a new land, for himself and his heirs.

I have purposely omitted speaking of Van Diemen's Land, a country too much filled up already to offer the prospects which should tempt the emigrant. It may be here remarked that the equably warm temperature of New Zealand, and the comparative moisture of its atmosphere, appear to be the most favourable possible conditions to the rapid and florid growth of trees, shrubs, and flowers. Hence a few years' planting and gardening around a house will make more show than four times the period would in England. A switch of willow, for instance, stuck into the ground, will in three years form a noble tree, sufficient to overshadow a small house. As to the finer sorts of such plants, as geraniums, verbenas, and fuchsias, they grow with a luxuriance and strength which must astonish every lover of flowers who sees them for the first time.

Add to its natural advantages the fact, that various circumstances, especially the expense of the long passage out, have combined, and do still combine, to take there a class of settlers of a higher and better order than

can elsewhere be met with; and it will appear that not only in natural features, but in respect of its social advantages, New Zealand may fairly claim to stand first among the great colonies which invite our surplus capital and unemployed hands. It is a striking fact in corroboration of this view, that while in Australia, with all her boasted advantages, the traveller cannot fail to remark a constant yearning after an English home, and will hear frequently an avowed intention of leaving the colony as soon as sufficient money has been made to allow of retirement from it; in New Zealand the settler has no such dissatisfied longing, or wish to give up his adopted land; on the contrary, his object seems usually to be to persuade as many as possible of the friends he has left behind to follow and join him, and thus complete his satisfaction with his new abode, by giving, in their society, the only charm he finds it wanting in.

We have now to leave the general description of the island, in order to enter upon the second head of our subject, and to remark upon the peculiarities of each province, and its relative drawbacks and advantages. I would here remind you that a seventh province has been lately carved out of that of Wellington, and added to the six into which the Constitution Act and previous custom had originally divided the colony. I propose to take them in succession, commencing with Auckland, which lies the northernmost, and has a right to our first attention, as it contains the present capital, and is the most populous and richest of the whole.

Auckland, the town after which the whole province is named, was founded in 1841 by Governor Hobson, who very properly removed the seat of government from the inconvenient and out-of-the-way situation in which it was before placed, at the Bay of Islands, some 100 miles further to the north. His choice was at first condemned by many, for the scenery and the soil around the little metropolis are neither of them as attractive as those of many other parts of New Zealand, but events have proved the wisdom of his selection.

Fronting the town, which faces the east, is one of the most commodious harbours in the southern hemisphere, good in itself and easily accessible, whilst a chain of islands, lying considerably seaward, not only protect its approach, but shelter the coast communication for many miles to the north and south, thus affording extraordinary opportunities for the development of local traffic. But this is not all: from the western side of the island there penetrates, in the direction of Auckland, a large land-locked sheet of water, called the Manukau, one branch of which reaches to within seven miles of the town, which is thus placed within the easiest reach of the whole coast on either side. The entrance to the Manukau has a bar, but there is depth of water on it at high tide to allow a moderate sized vessel to pass over in almost any weather. This approach has been for years used by both steam and sailing vessels, and will doubtless be always of the greatest value to the trade of the town, as it saves a passage of 400 miles round the north of the island, to the harbour of Auckland, to any vessel approaching by the western coast. The Manukau is also already very much used for local inland navigation, and in this respect will be of increasing importance, inasmuch as in one part it approaches to within eleven miles of the great Waikato River, the

natural highway to the southern and richest parts of the province, the noble stream of which, navigable for 150 miles, is thus only removed from Auckland by a sail across a lake and eighteen miles of land carriage. One of the few macadamised roads of which New Zealand boasts as yet, connects Auckland with the Manukau; so great, however, is the difficulty of securing regular labour for such purposes in the colony, that this road was only completed within the last four years.

The farming land about Auckland is not very inviting, being a stiff clay, which requires much labour to be expended on it in order to yield a good return. The extraordinary demand for supplies of all things eatable, at the Victoria gold diggings, during the gold fever of 1853-5, and the extravagant rise in prices which it produced in all the adjacent colonies, acted particularly at Auckland, where there are such great facilities for exporting. This made the value of farms, houses, and stock go up to exorbitant rates, and produced an unnatural degree of sudden prosperity among the agricultural population, which was succeeded by a rather depressing reaction, from which the settlement has only lately recovered.

There is some very good land to the north of Auckland, to be reached by coasting to the different small harbours, which lie scattered thickly in that direction. Towards the Bay of Islands, and along the narrow part of the Island, which terminates in the North Cape, the country is hilly, and not very improvable. But the great natural resources of this province lie towards the south, where the rivers Waikato and Thames, and some of the more remote harbours, as Kawhia, lead into fertile districts of unbounded extent, where the natural grasses, which do not grow on the heavier lands to the north, are first met with. Settlements far in this direction have already been founded, but have not increased as rapidly as might be, as the Government have not yet extended to such a distance the system of land purchase from the native tribes, which has lately thrown open some very good blocks of land nearer to the capital. I may refer, as an instance, to the fertile valley of the Wainku, situated between the Manukau and the Waikato, which was only opened for sale in 1856, and is already largely settled.

The Maories in this province are, generally speaking, by no means unwilling to part with their rights to such land as the Government wishes to purchase, but there is a natural desire, on the part of the latter, not to cause mistrust by overdoing their part, and driving the natives into too narrow or remote limits.

It is to be hoped that the present indifferent communication with those districts of the province which lie removed from approach by water, may soon be improved. Hitherto not even the energetic efforts of elected superintendents have been able to overcome the practical difficulties in this respect imposed by the want of cheap labour, and hence the range of the settler in search of land is very limited, when compared with the noble expanse of country, amounting to near fifteen million acres, which exists, and which is nearly free from those mountain chains which detract so much from the apparent extent of some of the southern provinces. As most of the accessible land has been occupied, or bought up by speculators for the purpose of holding it (and this kind of speculation has been terribly overdone in Auckland), it follows that at present most Govern-

ment grants of land, however well they may sound on paper, are made in such situations as to render nugatory the apparent advantage to the receiver.

The people of Auckland are a busy, thriving, prosperous race, ready to turn their hands to commerce, agriculture, or home manufactures. The trade, both coasting and export, is large, and so steadily increasing, as, combined with their natural advantages, to promise a steady future of prosperity to the province and its capital, and render safe and remunerative the investment of money there, provided it be employed with ordinary judgment, and properly watched over. The population has reached about 19,000.

I must not omit, before leaving Auckland, to make mention of the celebrated "pensioner settlements" in its vicinity, founded by Sir George Grey. They were suggested by him to the Home Government as useful for the defence of the settlement, but were generally regarded in New Zealand as an ingenious device for developing the neighbourhood of the capital, by bringing thither an increase of population, and an accompanying expenditure defrayed out of the imperial revenue. In this sense they have been very successful, and each of the four villages formed by him (and which were placed about the narrow neck of land, by which all approach to Auckland from the south, save that by water, must be made) has become the nucleus of a place of importance. It is to be lamented, however, that the class of men thus introduced into the population appears to have been carelessly selected from among the lower ranks of the army, and has much tended to increase and confirm the fatal habit of intoxication, to which all new Anglo-Saxon colonies furnish a painful number of victims.

The society of Auckland cannot be highly spoken of. The class of settlers who originally came there, many of them from Sydney, with which place Auckland has always been intimately connected, were not in general men of such high education as those sent to the southern settlements by the New Zealand Company and Canterbury Association. Moreover, the place has been for a long time divided by fierce factions. These originated in the resistance of the former colonial authorities to the extraordinary pretensions of early land-claimants, who had made so-called purchases from the native chiefs, before the days of settled government. One of these modest individuals, by the way, asserted his right to a quarter of a million of acres, and declared himself most barbarously used because both governors and supreme courts have declined to recognise his title.

Proceeding in a southerly direction from Auckland we come to the province of New Plymouth, or as it is now universally called, according to the old native name, Taranaki, which is the smallest of the six original divisions of New Zealand, and occupies a strip of the western coast, extending from the boundary of Auckland to that of Wellington, and contains about three million acres of land. The settlement in question was founded in 1842 by a party of colonists from the neighbourhood of Plymouth, and still retains marks of its origin in the strong Devonshire accent of many of its inhabitants, and their strict adherence to clotted cream and other local luxuries of their native country. The town, or rather village, which is the seat of the provincial government, was laid out

originally on a scale suited to a city of some 50,000 inhabitants; but the ambitious desires of the projector have not been realised, and scarce one-hundredth part as many people occupy it, the whole population of the province being probably under 2,500. And yet this small number of settlers are found in the most lovely and fertile scene which the colony boasts. A rich and well-watered plain, fringed with noble forest, rises gradually from the sea into a group of green hills, which meet together at the base of the matchless Mount Egmont, *the mountain*, as the settlers emphatically call it; whose bright summit of snow, rising 9,000 feet high in peerless solitude, and contrasting with the rich colours beneath, forms as lovely an object as the world can show. The colonists of Taranaki, of whatever class, have a laudable pride in this great ornament of their province, and, in placing a new house, the first thing looked to in the site, is the having a good view of it.

The soil around the settlement is light and easily worked, and, where there is forest to be cleared, the great richness well repays the labour. The summers are less warm than those of Auckland, and the climate on the whole superior. The people, whom the advantages of such a soil and climate lead mostly to agriculture, are homely and friendly, and the secluded nature of the place, the reason for which will presently be referred to, makes them more like a portion of the rural population at home—only happily without the poverty of the latter—than those of any of the other settlements.

It may now be most reasonably asked, why has the province made so little progress, seeing that it is one of the oldest in the colony, and is blessed with such natural advantages? The reasons of its backwardness are two—and every settler knows them but too well. The first is the want of a harbour. There is not one decent one along the whole strip of coast which belongs to the province, and the trade of the town is carried on through the surf of an open roadstead, where vessels can never be certain of lying for twelve hours together, as the first sign of a westerly breeze is the signal for them to slip anchor, and escape from the danger of a lee-shore. The energy of the provincial government, which has been compelled to undertake the shipping and landing of all goods and passengers, has done all that is possible to overcome this difficulty, by providing most excellent boats and trained crews for the purpose. Notwithstanding these efforts, the landing and embarking at New Plymouth must always be most inconveniently dependent on the weather.

The other drawback to the development of the settlement is a still more serious one, and until lately it partook more of the character of an actual danger than of a mere inconvenience. The number of natives living close round its limits, considerable when the first settlers landed, has been largely augmented since the prevailing Christian influence of the missionaries caused the liberation of a great many of the former Maori inhabitants of Taranaki, who had been led away into captivity during a series of wars carried on against them by the tribes of the north, and by the return of others whom fear had driven away from the country, which they, like the white men, justly considered as the garden of New Zealand. The constant increase of the Europeans, and their urgent desire to acquire more territory than that originally sold to them, awakened suspicion in their Maori neigh-

bours, whilst their unarmed character, and the absence of any apparent protection by their Government, (for no troops were stationed here,) gave birth to a contempt for their inferior strength. Hence for many years the Europeans had to submit to petty insults, and sometimes to serious annoyances, without redress, and of late the native hostile feeling showed itself in strong opposition to any sale of land to the white man by any portion of the surrounding tribes. On this subject the Maories, however, were not unanimous, and the two parties broke into open warfare in 1855, and erected their forts close to the borders of the settlement, into which their armed parties frequently entered, committing depredations, and the more hostile one threatening destruction to all Englishmen. The very unpleasant nature of these circumstances had hitherto been kept, in colonial fashion, perfectly quiet, lest it should injure the fair fame of Taranaki, but it had now grown too dangerous to be endured, and the government at Auckland were earnestly supplicated for aid. In consequence of this request a body of 550 troops was despatched to the spot under an able officer, who averted all threatened evils without actual recourse to arms. An efficient garrison has been ever since kept up at Taranaki, and, the chief native leader of the opposition having been lately killed, it is hoped that all danger of any future disturbance has passed away. The confined limits of the Government land of the province are, however, an unpleasant memento of what has been, and a considerable objection to the settler.

Notwithstanding the two great disadvantages I have striven to put fairly before you, the charm of Taranaki is to me so great, that, if I were now in search of a colonial home, I should not fix upon any other part until I had revisited it, and judged for myself whether I could not be suited there.

Taranaki is, I must in justice add, the only province where the grants of land to military settlers are in situations accessible, and therefore likely to be available for any practical purpose within the present generation.

The province of Wellington, the next in order, occupies, as you may observe, the whole of the southern part of the Northern Island, and is computed to contain about 7,000,000 acres. It is here that we first meet with the continuous mountain chains which cover so large a part of New Zealand, and which, splendid as they are to the eye, the settler would often desire to exchange for something less romantic and more practical. The town which gives its name to the province was founded by the New Zealand Company just before the rival Government settlement of Auckland, and the energy displayed in hastening the emigrants to it was undoubtedly a main cause of the peaceful possession by the English of this fair colony, on which the French at that time were turning a longing eye. Time would fail were I to attempt to describe how ship-loads of emigrants, who had purchased town lands and country farms, were thrown on the narrow beach of Wellington, to discover too late that their town acre lay on some slope where no house could be raised, and the farm on some inaccessible mountain side which could neither yield pasture or crop. They had to come to the knowledge also of the fact that the splendid land-locked harbour of Port Nicholson, of which they had heard so much, lies in a funnel of mountains, which causes frequent and lasting storms of such severity as to cut off all communications between the vessels anchored off

the shore and the beach close by them; that the town itself was most badly placed, being eight miles off from the only tract of arable land within a day's journey,—the Hutt Valley, and crammed into a most inconvenient situation between the sea and steep hills, which have scarcely left road-way along the beach; that the larger valleys of the interior lie mostly at great distances, to be reached only by a rough coasting voyage; and that the entrance to Port Nicholson forms such a loop with the straits outside, that the wind which brings the ship from Australia or England, fiercely repels her attempt to enter the channel, and compels her to await in that tempestuous and narrow sea the change which, every few days, turns the blustering north-west to fierce south-east. All these discoveries they made and rued, as many a successive emigrant since that time has done; but they were a hearty set and worked bravely on, and, aided by systematic puffing on the part of the Company at home, they founded a prosperous and growing community, which is now strong enough to draw to it a steady increase by its own force of attraction. The Company did not confine its efforts to the exaltation of their own chief settlement, but having in vain tried to get the central government removed thither, by acting on the local authorities, they did all man could do to depreciate the rival colony of Auckland at home. For this purpose books were written and exhibitions opened, ostensibly by private individuals but in reality under the Company's agency, with the double object of praising Wellington and injuring Auckland. But it is sufficient to add, in respect of these proceedings, that the natural advantages of the latter settlement have ever kept it in advance, to the intense envy and disgust of its southern rival.

A new and terrible drawback has been added to those already pointed out, as belonging to Wellington. It is found that the immediate neighbourhood is subject to a recurrence of earthquakes, and is evidently near the centre of an alarming volcanic action. Twice already has the settlement been desolated by these convulsions; no building of brick or stone is now erected there, and the chimneys (only 8 per cent. of which escaped injury on the last occasion) are necessarily built outside the houses, and constructed in the upper part of iron pipe. Those only who know the colonies well, can conceive what pains have been taken to conceal these facts from the public at home; nor is this unnatural in men whose whole property is dependent for its future value on a regular stream of immigration.

Wellington cannot be said to be an agricultural country. The only farming land within reach of the town, the Hutt Valley, a rich strip of ground, but very subject to violent floods, is taken up, for it only contains a few square miles. There are, however, many fine tracts for pasture in the interior, and others on the large rivers, which can only be reached by the coast line. The more active of the old settlers have taken up all the most accessible of these, and the export of wool has become considerable.

The climate of the province of Wellington is usually fine and remarkably healthy, the air being more bracing than that of Auckland. That of the town is, from the peculiar local situation before referred to, so continually subject to boisterous winds as to make it somewhat disagreeable, especially to the softer sex.

The energy of the provincial authorities and the inhabitants has

triumphed so far over the disadvantages of the locality, as to bring in a considerable increase of population during latter years: there cannot be much less than 10,000 people in the province at present, even deducting the loss by the cutting off the new province of Hawke's Bay.

The most flourishing of the out settlements of Wellington is Wanganui (the English name here, as at Taranaki, has been abandoned for the native one), which is situated about 120 miles to the north, and on the western coast, on one of the noblest of the fine rivers before alluded to. The little town and its trade are prospering, and the land is so fertile, without having as yet reached extravagant prices, as to offer probably more inducement to the farming settler than any other of the offspring of Wellington. Wanganui is however open to the objection of being within the reach of the earthquakes, which have done considerable damage there.

Proceeding round the northern island to its eastern coast, the next in order is the new province of Hawke's Bay, formerly better known by the name of its chief settlement, the Ahuriri Valley. This was, as before-mentioned, made separate from and independent of Wellington a few months ago, and the new town of Napier, at the entrance of the Ahuriri river, created into its capital. The province contains near four million acres, being about one-third of the former contents of that of Wellington. The sheep-farms of the Ahuriri are celebrated for their excellence, and since they became thus known the trade and population, both very small five years since, have been rapidly increasing. As might be expected from its being an offshoot of Wellington, the necessary supplies were at first imported solely thence, but latterly the Auckland merchants have been exporting considerably by the coast to the new market, to which indeed they have naturally as ready an access as those of the former town. An important geographical feature in the province, as the later maps show, is, that part of the western boundary is that large stream the Manawatu, which promises to give a good communication from the back settlements to the west coast near Wanganui.

The chains of mountains lying around Wellington do not appear to extend far into Hawke's Bay, and there is very much available land yet open to enterprise and capital for sheep-farming.

The earthquakes have been very severely felt here, and constitute at present the only serious drawback to the prosperity of the province. The climate is reported to be very good, and, judging from analogy, there is no reason to doubt its continuing to maintain its reputation.

We have now to cross Cook's Straits, and proceed to a survey of Middle Island. Its whole north is occupied by the province of Nelson. The chief and only town of the same name was founded by the New Zealand Company not long after Wellington, and, like that elder offspring, was not suffered to languish for want of notice. It is prettily situated in a nook of the mountains which border the large deep bay called Wide Bay, and has a curious secure little harbour, easily approached and entered by small vessels, but not convenient for large ones. There is a narrow plain of good land running from it round the bottom of the bay, and which I beg you will not despise, for the mountains along most of the coast are not so generous, and often terminate abruptly in the sea.

All that has been said of the mountainous character of the Wellington

country applies with treble force to that of Nelson, where alpine ranges of gigantic aspect, rising in one part to 13,000 feet high, crowd thickly on each other. I have sailed round three-quarters of the coast of the colony at different times, and have not seen anything like a piece of level ground, save that bordering on Wide Bay in parts; in consequence of this want the harbour of Queen Charlotte's Sound—which a special map would show to be one of the finest in the world—is unused and unsettled to the present time. One large and fertile valley, the Wairau, which communicates by a circuitous road with Nelson, has been long known and occupied by sheep farmers. This district, which is now pretty well filled, seemed to be the only field for the superfluous energy of the province, until the recent gold discoveries. Of these last I need merely say, that, though rich enough to tempt a trial, they have proved not sufficiently so, to draw together or maintain such a population of diggers as to produce much influence on the colony. Gold, scattered in nearly a similar way, has been long discovered in the Auckland province, but the search has not been found to be regularly remunerative. The copper mines of both have also, as yet, proved failures.

The population of Nelson amounts to seven or eight thousand, but it is not increasing as fast as that of other provinces, if we except the temporary rush produced by the news of the diggings. The confined limits of the useful portion of the land will naturally tend to drive the more energetic spirits of the settlement into the neighbouring province of Canterbury, and the more especially as a way has been discovered by which flocks may be conveyed through the mountains into the latter.

The climate of Nelson is, perhaps, the finest in the world. The mountains lie round it so as to shelter it from the prevailing gales of the straits, instead of drawing down, as at Wellington, their concentrated force; and the vicinity of the snowy ranges tempers the warmest weather with an agreeable and healthy coolness. In this one respect Nelson may be allotted the palm of superiority to all other parts of New Zealand; but the want of available land constitutes so serious a drawback that it is certainly not a place to be recommended to any class of settlers except the special one of invalids.

I have said nothing of the nominal area of Nelson. The surveys are not sufficiently accurate to give it, and, were they so, the alpine character of the country would leave but a mere portion for the present purposes of man. No doubt more valleys will be discovered, opened, and used; but the mountains will last during our generations, and, though they may gradually be furrowed and washed down by storms for the use of succeeding ones, yet we cannot wait for this process, but must, in gazing around, feel inclined to say with the German savant who visited the province some time since, "My good friends, you am come here one five tausend year too soon."

Canterbury, as you may observe, occupies the whole of the central portion of the middle island. There can be but few, if any, here who do not know something of the history of its settlement in 1848, of the special High Church views which it was intended should there be developed unrestricted and full blown, of the high fixed price which all the land originally opened was to be sold at "to promote education and internal

improvement," and of the noble spirits and sanguine hearts of those who first sailed for the new Utopia. Alas for their hopes! alas for all who go to an infant colony unprepared with natural strength or artificial training to encounter the rude realities of a working life! Alas for the pious designs of the originators! The purely episcopal land has been entered upon and divided with the Church by the influx of members of a dozen different sects. The first gentlemen settlers have in too many instances disappeared, and their places are often filled by the rough labourer brought out in their train, who is now lord of the soil where he had landed with no capital beyond his brawny arms, to invest. The internal improvements are yet many of them deferred from year to year by the usual colonial difficulties—and yet the province flourishes bravely. Its climate is fine, and the summer heats tempered by the airs from the Nelson mountains to the north, or the cool south wind from the Antarctic ocean. The lands lying outside the original high-priced Canterbury block are sold (as nearly all are in the other provinces) at so moderate a rate as to tempt capital and energy from torrid Australia, as well as from over-populated England, to try the rising colony, and are so charming, that few who try, wish for any other home.

The lofty ranges which still occupy the western side of the island have here retreated from the eastern coast, and left vast plains where there is yet room for all comers. The familiar productions of the mother country were early introduced, and have invariably done well here, and the whole place has an aspect of improved comfort and stability, such as may be sought in vain in many of the much older colonies. Its commercial prosperity and population are undoubtedly increasing from year to year, and are strongly marked by the exports and imports, which are rapidly augmenting, and promise soon to surpass those of all the elder provinces, Auckland excepted.

The public treasury of this interesting settlement is at present in a happy state of plethora, and the authorities are taking serious steps towards the tunnelling through a most inconvenient hill which at present divides their capital of Christchurch from the excellent harbour of Lyttelton, now generally called Port Victoria. This improvement effected, there will be little left to be desired for the advancement of Canterbury.

Last, but not least, of the settlements of New Zealand, is that of Otago, founded in 1849 by members of the Free Kirk of Scotland. This noble province, very much of which is quite unexplored, contains probably more available land than any of the others. As in Canterbury, the western portion is of a mountainous character; the eastern generally level, and highly suitable for pastoral purposes. The port being very remote from the northern settlements, and the country more recently opened than the plains of Canterbury, the original settlers have been more fortunate in retaining their peculiar views uninterfered with, than those of the former; and extreme Presbyterianism and extreme Scotticism still flourish side by side round the little capital, which is, of course, named Dunedin. Not long since the superintendent refused to give his sanction to an ordinance of the Provincial Council for appointing an agent for forwarding emigrants from "Great Britain," objecting that the words used should be an emigration agent "for Scotland and other parts." A stream of new

settlers has now set in from the mother country, and from Australia, which promises soon to put an end to this miserable narrow-mindedness.

The country of Otago contains greater undeveloped resources, and a finer field for the inquirer for pasture lands, than any of the other provinces. Its enlarged prosperity is merely matter of time, and it is now so new as to offer very fine openings for capital invested in stock. The port is not so good as that of Canterbury, but large ships do lie there, and manage to accomplish all that they find necessary. The only other complaint I have heard made, respecting the province, is that of a want of wood in parts ; but this matters little to the sheep farmer, who, in Australia, generally dispenses with any thing like a fence, and may do the same in New Zealand.

Nothing is now wanting in Otago but sufficient supplies of labour and capital, and these are steadily arriving. Of this fortunate province, and her fair neighbour Canterbury, it has been truly remarked, that in them may be found every advantage which Australia offers the settler, with a climate far superior.

It now only remains for me to offer briefly such remarks as may be likely to be practically useful on the subject of emigration to New Zealand.

And first, as to the classes of persons who may be likely to succeed there, or the contrary. Those who are living quietly in England, upon small regular incomes, which are enough for moderate wants, and who have no available capital, will do well to remain at home. Their expenses in the colony they will find quite as high, and they would there lose many of the comforts of civilisation with no corresponding advantage.

To those who have a little money to invest, with their own labour, and purpose trying sheep or cattle farming, it may be important to know that they should not attempt it, unless they can manage, on arriving in the colony, to have at least 2,000*l.* at their command. Less than this would but prove disappointing.

There are a considerable class of persons at home living up to or beyond pretty good incomes, but, were they out of the temptations of society, might save yearly a regular sum, and perhaps wish to do so, but have not sufficient resolution to carry out their desire. These would in a colonial life find two advantages: they might live just as they pleased as to their expenditure, and the surplus of their income could be invested, as it accrued, to very much greater advantage than in England.

Idle young men, who are looked upon as good-for-nothings at home, and are shipped off to the Colonies to get them out of the way, do in some cases reform, and struggle on to a decent subsistence; in the great majority, however, the temptation to drunkenness overcomes them, and they fall victims to it at an early age. No one of any class, who has the least tendency to the vice of intoxication in the mother country, can be safely trusted to settle in a colony.

There are at home many steady well-dispositioned youths, who have no great talent, or interest, wherewith to provide for themselves amid the crowd of strugglers for every means of subsistence. To such New Zealand affords many openings; but they should endeavour, before starting, to acquire a practical knowledge of surveying and of carpentry, two arts for

which the demand in new countries is incessant, and the knowledge of which is most valuable, even to those who do not get their living by them. This knowledge would avail much more than the rudiments of a profession, for, like all the other Colonies, New Zealand is already overstocked with mere professional men; the class of clerks, bookkeepers, and other writers and accountants, is, as every one here has probably heard, completely at a discount.

I have no where met with an adequate description of the miseries encountered by the mother of a very young family, whose father has dragged her into the bush to share a settler's life; no words can paint it truly. Servants in New Zealand will rarely go into the country at all, and few will stay in any house with a number of children. Ladies situated as above are therefore generally left alone to perform the most menial offices; between these and the care of infants, the health usually breaks down, the temper fails, the children grow up neglected, and the imprudent step induces a life-long misery, and frequently a premature decay and death. No narrowness of resources, or yearnings to be working for those you love, should tempt a family to emigrate, till the younger members are old enough to be nearly independent of a mother's care.

And now to speak of the mode of proceeding. A young man going out alone, and who is to receive some little capital from his friends, should not have power to touch it until he has been at least a twelvemonth in the settlement he chooses, and acquired a thorough knowledge of it.

No one, indeed, who intends making any investment, should think of doing so on his first arrival in a new country. Let him rather live in a quiet, economical, and observant way, for the first few months; the experience thus gained will richly repay him. The capitalist will find so much choice between the purchase of property, mortgages at rates quite unknown in the old country, public loans, and investments in farming, that he will do well to pause before he commits his means irrevocably to either. Mines worked with labour at colonial wages are generally failures, and I only mention them to recommend their being avoided.

It is a common mistake for persons with moderate means who are proceeding to the colonies, to invest a considerable part of what they have in the purchase of agricultural tools, ready-made houses, and the like. This should be particularly avoided, for two reasons. It is desirable to have as much money as possible available, when a short residence in the colony has rendered the new arrival *au fait* at what his real wants are, and what is likely to suit him,—a knowledge that cannot be by any means acquired at home. It is also very much better not to encumber yourself with a load of articles which must either tie you to a spot which may not be found such as you would like to fix your home in, or must be sold at a sacrifice if you desire to try some other locality. I have known a retired officer arrive in New Zealand with a load of useless purchases foisted on him by the outfitter as being indispensable for a bush life, the price of which would have gone far to settle him in a farm already cleared and built upon, the only way in which his health and habits would have let him have any prospect of succeeding.

I will not detain you by going into the hackneyed subject of the nuisances English servants are in a colony; but only say that no one should spend

money in taking those out with them who are not bound to them by a real tie of affection. No domestics are so troublesome in New Zealand as those who have just arrived from the mother country, and whose heads are turned by the sudden change of their relative position with that of their employers. No maid-servants can in general be persuaded to stay away from the settlement towns. The best chance of getting assistance for those who intend really trying the bush life, is to engage a respectable married couple, of country habits, and to pay them the full colonial wages from the very day of arrival.

I have already given a warning, and I would desire to repeat it most emphatically, to those who are seduced into the idea of emigration by so-called "grants of land to military settlers." As soon as a colony is past its infancy, such grants are thrown so far back into the more inaccessible parts, as to cease to be of any use, and to bear a merely nominal value. Taranaki is, as before noticed, the only province where I found they are really made of use by the individual receiving them.

The last recommendation I have to offer, I would most seriously strive to impress. It is simply that any married man who is bent on a New Zealand life should go out first, unencumbered by his family or property, free to move about, and see for himself whether his views for the future can be realised in the colony, and, if so, in what part. If they cannot, he will be thankful for making the discovery before any irretrievable step is taken. If they can, he will never repent the time occupied in deliberately making his choice of his future home. He will find this also a saving measure to his purse, as the expense of maintaining a family on first arrival till the home is fixed on is a very serious matter, compared to that of the maintenance of a single individual. I need hardly add, that no retired officer should surrender the whole of his income to settle himself in any colony, till his home be actually made there, and found to suit him.

In conclusion, it may be brought to your notice, as a summary of the observations now made on the different parts of New Zealand, that Auckland is to be recommended as a field for commercial enterprise and the investment of capital; Canterbury and Otago to all who desire to try a sheep or cattle farm on a large scale; the latter province, and that of Hawke's Bay, to such as, with smaller means, wish to begin the same life where the pressure of competition is least; and Taranaki to those who seek for the richest and most readily available land for agriculture, and the fairest spot for a home.

Friday, April 29th, 1859.

General SIR WILLIAM GOMM, K.C.B., in the Chair.

ON THE ADVANTAGE OF CULTIVATING THE NATURAL AND EXPERIMENTAL SCIENCES, AS PROMOTING THE SOCIAL COMFORT AND PRACTICAL UTILITY OF MILITARY MEN.

By Major-General PORTLOCK, Member of the Council of Military Education.

IN addressing an audience assembled in the lecture room of an Institution founded by the members of the Naval and Military Services on a subject not directly connected with warlike operations, either on land or on sea, I feel, especially at this critical period of our history, that it may be necessary to clear away from your minds some natural, or rather ordinary, prejudices; and to entreat you to adopt a more lofty principle than that which would require no more knowledge to be gained than is considered just sufficient for ordinary practical purposes, or as having a direct bearing either on the production of wealth or on the special objects of some particular profession. This rigid application of the *cui bono* test to mental operations has a tendency not merely to narrow the basis of preparatory education, but also to limit the extent and diminish the chances of future progress. No one can indeed over-estimate the ill consequences of so narrow a view of the objects of education, for who can foresee at what moment some branch of knowledge, little valued when acquired, may not prove to him an instrument of power, by which he may overcome a difficulty otherwise insurmountable or secure a result otherwise unattainable? The fable of the Mouse delivering the Lion may be indeed accepted as an illustration of the power which an intellect sharpened by study and stored with the facts of experience bestows even on the physically weak, enabling him to resist or to overcome, and in many cases to assist, the strong. Force of mind will, indeed, in most cases be more than a match for force of body, just as a small army will often baffle and even vanquish a much larger one, as was the case in the wars of Frederick the Great.

My object, however, is first to consider this subject under a different light, and to impress upon your attention a fact which, though generally admitted to be true, is too often forgotten, overlooked, or neglected in practice; namely, that mind and body together constitute the human being, and hence that the health of the mind is as necessary, as the health of the body for the preservation of the living man in a state of vigour and effectiveness. The old aphorism, "*mens sana in corpore sano*," is indeed equally true, whether interpreted as meaning that a healthy body is neces-

sary for the preservation of a healthy mind, or as meaning that a healthy mind, that is to say, a mind active and free from oppressive care, is necessary for the preservation of the body. This statement may at first sight appear to you speculative or metaphysical, but in practice it has been amply and frequently confirmed. So long as man is in motion, and the excitement of changing scene, of varying events, and of prospective danger continue to act upon him, the machine maintains its efficiency; but should this excitement cease, and passive difficulties, such as those of heat, cold, hunger, thirst, or the still more fearful ills of idleness and ennui, begin to surround him, the mind, wanting its wholesome and proper aliment, begins to prey upon the body; the body loses its tone, and as it gradually declines reacts upon the mind, which in its turn hastens the decay of the body, until at length that rest, which even sleep refuses to bestow, is attained in death. This necessity of attending both to the mind and to the body in training up the individual man is equally manifest, whether the object is to obtain a maximum of advantage from the efforts of the body politic, or of the body military; and the observation of Von Decker is truly philosophical when he states, that a "nation, having resolved on a war, cannot expect to realise great events, unless by concentrating upon the object in view all its energies—physical, moral, and *intellectual*, or, in other words, its whole vital force." This great principle has been ever kept in view by wise Commanders, whether on land or on sea; and, although the means adopted may vary with different men and in different nations, still the object is the same, namely, to keep up the *morale* of the men,—that expressive French word meaning a mental condition so strengthened as to resist the many causes of physical depression which are likely to assail both the sailor and the soldier in some period of their service. Marshal the Duke of Villars, so well known as one of the Generals opposed to Marlborough at the bloody battle of Malplaquet, at which he was severely wounded, when he returned to the army of Flanders in May, 1710, set to work as his first step to reanimate the drooping spirits of his men by exhibiting before them a cheerful and undismayed countenance; and then by a Ball he recalled once more the natural gaiety of a Frenchman's heart, no doubt with the conviction that once set to dance he would be equally ready to fight. This you may think was more suitable to Frenchmen than it would have been to Englishmen; but I think we shall see that similar expedients may be adopted with equal advantage even with Englishmen.

That such a mode of freeing the mind from corroding care does ever excite a smile in some is because few, if any, have hitherto ascribed to its true cause that peculiar influence which the graceful movements of the dance, the rapid motion of the hunt, the song of birds, the ripple of the running brook, the sighing of the wind amongst the branches of trees, the varied colours of flowers, or the green tint of a grassy bank, exercises upon the mind, and through it upon the body. To me the fact of such an influence being exercised appears sufficient to prove that there is a natural link of connection between man and all the other works of creation; and, as the pleasure derived from the contemplation of external objects can only be realised by the instrumentality of the mind, it is manifest that the less the mind is trained to observe, to think, and, I may say, to enjoy, the more the body must be deprived

of those springs of action and sources of happiness which are so eminently fitted to keep it in health and vigour. Many now present will doubtless remember how wisely our Arctic Voyagers sought for other means of repelling the chilling effects of intense cold, and of the unvaried dreariness of the scene around them, than those afforded by good food and clothing; and established for this purpose, on the bosom of the ice and amidst the surrounding snow, amateur theatricals. I have before me the amusing work entitled "Illustrated Arctic News," composed and published by the officers of the "Resolute," when in search of Sir John Franklin and under the command of Captain (now Admiral) Horatio Austin. If you look at the somewhat grotesque, but still amusing and exciting, accounts of the theatrical entertainments, exhibited on a stage of ice and before rough sailors wrapped in furs or other repellents of cold, and read the witty commentaries on passing scenes, you will readily perceive that such a mode of entertainment, by keeping them from dwelling upon surrounding difficulties, was one of the best expedients that could have been devised to keep up the spirits of men under very difficult circumstances, and to enable them to bear up against trials and privations under which, without some such stimulus, they must have sunk. You will all recollect that the same system was adopted with the same results before Sevastopol, where the French and the English had their theatres. Now, the act of preparing for a theatrical performance is an act of some mental labour—it requires those engaged in it to read and to commit much to memory; yet, that labour was cheerfully undertaken, and proved a source not only of enjoyment, but of mental and physical renovation.

I could pursue this subject further, but I will content myself at present by observing, as regards the soldier, that though much has unquestionably been done towards his intellectual and his moral improvement, and also towards his physical comfort, something more is required; namely, that more attention should be paid to his recreation—a necessity which has long since been admitted in respect to the poorer class of civilians. I think that the soldier requires his playground as much as the schoolboy; and I long to see the time when even school studies will be more directed to those subjects which encourage the boy, as well as the man, to wander in the country and admire its flowers, or to climb mountains and examine rocks; in fact, give them motives for taking that exercise which imparts health to the body and vigour to the mind.

Neither officers nor soldiers are always provided with means of healthy recreation. Those who hear me may perhaps remember, how dreary and wretched country quarters, cut off from all sources of amusement, have sometimes appeared; though perhaps that is not so much the case now-a-days, when railroads facilitate communication, and take at least the officer rapidly from the dull village to the gay town. Under such circumstances as the above, had a spirit of research, and the tastes created in early days for the natural sciences, been called into action, no place would have been found deficient in sources of amusement, and of amusement always conducive to health. In fact, the study of every branch of science must have a cheering influence, and, as an example of what may be done by military men, I will read to you a remark of Captain Martin De Brette, who is an eminent officer of the French artillery. He had commenced the construc-

tion of an instrument (which is a modification of that invented by Professor Wheatstone) for testing the velocity of moving bodies. Whether Captain De Brette arrived at the same idea independently I cannot say, but it is only natural to expect, that able men pursuing scientific researches should often stumble upon very nearly the same ideas; but his is an imperfect instrument compared with that of Professor Wheatstone. He says, "I was called to Algeria on duty; I was therefore obliged to attend to the immediate and pressing duties of my new station, and to reserve the continuation of my inquiries till I entered again upon the leisure of garrison duty." It is this leisure which I hope one of these days will be more occupied by military men, in researches and studies calculated to invigorate both their minds and bodies.

You will readily, I think, gather from what I have now said, that I myself consider the object of all education to be twofold; firstly, to give the student such an amount of some special knowledge as may be calculated to assist him in his future professional life, whatever it may be; and secondly, to afford him food for the exercise of his mental faculties. In our ordinary schools the great staple of education is, as you are aware, the classical languages. When this study is carried to a certain length, and matured at our colleges and universities, it unquestionably fulfils both the objects to which I have referred, so far as the persons for whom it is principally intended, namely, the members of the learned professions, as the Church and the Law, are concerned; but, if you stop short at an intermediate point, then it is impossible not to feel that enough has not been done to satisfy either the one or the other of those two objects.

I know perfectly well there are cases, and I can give you examples, where a large amount of classical knowledge has proved a source of great encouragement, and of great consolation under circumstances of great difficulty. I know one young gentleman, an officer of Artillery, who passed through the Royal Military Academy, Woolwich, at the time I was connected with it myself, and who, having received a good classical education, gained the prize for composition upon a particular theme—theme writing being then a mental exercise adopted at that establishment. I have since had the pleasure of reading some of his letters from India to his mother. Those letters breathe a spirit quite distinct from that of an uncultivated soldier. He appears to observe everything like a man of refined taste and of truly cultivated mind, and his descriptions, full of classical and scriptural allusions, read like the pages of a practised author. The spirit and feeling with which he writes, prove that the education which he had received enables him, in a distant region, to find sources of enjoyment in the objects around him, which would be totally unavailable to any one who had not received a similar education. I might indeed give you a still more forcible illustration, in the case of an individual who is respected by every military man, but whose modesty would not permit me to name him. I cannot conceive a more beautiful picture than that of such a person sitting down in one of the tents or huts before Sevastopol, surrounded by everything calculated to distract his attention; whilst wrapped in his cloak, to keep off the chill of a freezing temperature against which the gloomy tent, imperfectly warmed, if warmed at all, by artificial means was no

protection, and lighted only by a flickering candle—he pursues his literary recreation undisturbed by the din of war around him. How different, indeed, the circumstances to those under which a college student consumes the midnight oil! Polybius was probably never studied or read under such circumstances before, and all will admit that the gallant soldier was in this instance a true philosopher. These are examples of the results of sound early education even on the classical model; but they cannot be looked for in the great mass of persons, who, after many years passed at the schools, leave them with little more than the power of construing or translating the most simple Latin passage, and then only when they are allowed to take the exact passage, or at least to select the author they have read twenty times before.

I look upon mathematics not exactly in the same light as the classics. The lower branch of mathematics is essential to everybody; no one can, for instance, suppose that any military officer should be considered sufficiently educated who is unable to work out a common rule in arithmetic, or to keep a soldier's accounts: but the higher branches of mathematics require a degree of mental exertion, and a degree of mental power, that it would be out of reason to expect to find in all military men.

But when we leave these studies, and look to the natural sciences, the case is totally different. In them we have sciences which are at once fitted to exercise the highest faculties of the mind, and which at the same time tempt the student to the fields or to the mountains, promoting the health of the body whilst invigorating the mind. It will therefore be my object in the first place, before I come to the final part of my lecture, which will refer to the experimental sciences, to show you some of the advantages which military men may derive from the study of the natural sciences, both in a practical and in a social point of view, understanding by the term "social," that they promote and increase the happiness of a man, by setting him above any little difficulties or disagreeable circumstances which may surround him.

In the natural sciences at every step which you take, something new will present itself to be looked at, something to be wondered at, something to be admired. There are plenty of objects to be studied at home, and if you go to any other country, whether it be in Europe, the East Indies, Africa, or America, you will find everywhere something fresh—something which will excite your admiration, and kindle your enthusiasm. The Book of Nature is indeed inexhaustible, and wearies the less the more it is studied. I have had a diagram set before you to illustrate the deductions of geological science, and I refer to it first because it has many practical bearings.

A person totally unacquainted with the subject naturally looks upon the earth as having been always in the same condition as he now sees it; as a thing which was created in the form which it now exhibits. Such is the natural impression of a man of no scientific knowledge: for example, nothing is more common than the supposition, that of all stable bodies—bodies that are incapable of being moved, or upon whose undisturbed position you can rely with certainty—the earth is the most stable. The stability of the earth is, by every person unacquainted with science, supposed to be an established fact. Now to the scientific

man such an idea appears an error. First he finds, as you may see in the diagram, that instead of the earth being a great mass of matter, that came in the form in which we now see it from the hands of the Creator, it exhibits to us changes of various kinds, which have taken ages to accomplish. Those changes are various. We find that at every point of the earth's crust, where we can examine the strata, there has been more or less disturbance, by which they have been pushed out of their original position, the rocks which are designated stratified rocks occurring at very different elevations above the sea, some at 100, some at 200, some at 1,000 and more feet. If we were to look down through the ocean, supposing it so transparent that we could see to its bottom, and there observed deposits of mud, sand, or gravel under our feet, it would seem a natural thing; but when we observe the same description of deposits forced up to hundreds and sometimes thousands of feet above the level of the ocean, and we find that they teem with shells and other relics of various organic bodies which must have lived at the time of their deposition, then indeed we may marvel at the fact. Is it possible that any one who has had some little insight into these mysteries, as we may call them, has failed to take interest in their study wherever he had an opportunity to pursue it? Now these stratified rocks have been thrown up by the constant exertion of forces below. Those forces, whether gaseous or connected with electrical phenomena, or whatever may be their origin, act upon the melted matter under the crust of the earth and force it upwards. This melted matter pushes up all substances above it capable of being moved, and breaks and shatters those which offer greater resistance to the movement. The volcano represented on the diagram affords a natural and proper illustration of the phenomenon, because in volcanoes we see melted mineral matter forced up through the cracks or openings of the crater, and then poured out in a great stream, passing over and covering large tracts of country. The phenomena of many volcanoes are still exhibited before us, but we also see in the extinct volcanoes, such as those of the Vivarais and Auvergne in France, and those of other districts, proofs that, though there is no volcanic action now going forward in these countries, yet, from the nature of the rocks, and from various circumstances connected with them, volcanoes did there exist in full activity at some remote period, pouring out their lava exactly as Etna and Vesuvius do at the present moment. Then, if we carry our reasoning still further back, the same description of cause will account for the uplifting of various other intruded rocks—such as the greenstones, the granites, the syenites, and the porphyries—as all appear to have been pushed upwards, and to have dislocated at remote periods the earth's crust.

These facts are sufficient to show that any one walking over the earth's crust would look upon it with a very different eye when acquainted with geological science, even though his knowledge might be merely rudimentary, than when untrained to observe the facts, or reason upon the causes which have led to them. He will know that rocks have been uplifted by internal forces, that they have been worn and reduced to certain forms by the agency of water in the form of rains, of rivers, and of torrents; being deposited again in the form of sand, gravel, or mud;

then indurated, and again lifted up, to be once more shaped into the forms of hills and valleys. You can readily conceive that these effects must vary according to the nature of the rocks. If you are examining a country composed entirely of diluvial, or more properly detritic, deposits, or, speaking more generally, of stratified deposits distinctly composed of fragments of pre-existing rocks, such as sandstones, conglomerates, and so on, the wear produced by water will resemble that which you can now observe effected by rivers or by tides in narrow straits; but, if you look at those rocks which are supposed to have undergone a great amount of induration and metamorphism by proximity to the melted stony matter which has uplifted them, such as the mica slates and the gneiss rocks, which are very hard, the wear by water after upheaval is very slight, and it cannot be doubted that they have been fractured and dislocated in the act of uplifting. A defile or ravine in such rocks, as may be observed in mountain countries, exhibits steep sides, which cannot be ascribed solely to the action of water passing through it. In the one case the ravine is produced by the passage of water wearing through comparatively soft materials, whereas in the other it is the result of dislocation, the strata being uplifted and fractured so as to exhibit those steep jagged sides, which you meet with in the Alps and other mountain districts. Hence, if a military man, moving with troops in a country where the ravines had been produced by the gradual wearing action of water, were acquainted with the geology of the country, he would know that he could pass through a defile, because the sides not being inaccessible to his men, he might occupy, if necessary, the upper ground; but if, on the other hand, he found himself in a mountain pass through the harder rocks, he would know the almost impossibility of gaining the summit and dislodging his adversaries from it. We had indeed experience of this in our unfortunate contest with the Affghans, as you will remember the great advantage the natives took of being perched up on the rocks above our men, throwing down stones upon and destroying them, whilst we were reduced to a passive resistance, being unable to scale the precipices and dislodge them.

Further, I consider a knowledge of geology of great importance in the military sketching of a country, as the direction of the stratification must materially assist in enabling the topographer to determine the true form of the ground. I am aware that it is quite possible to sketch a country, as the objects on this table might be sketched, without having reference to what they really are; but to draw the plan of a country would be a very different task were the eye of the sketcher trained to look upon it as a result of geological causes. In looking at such a plan, and knowing the geological structure, he would, on observing certain features represented, be enabled to pronounce, "it is impossible that this can be a true representation, or the reverse." In this very case, therefore, a knowledge of geology serves a very important practical object. Geology has many other practical bearings, of utility to military men, in thus teaching them that certain things are possible, and certain other things not possible. If, for instance, we were in a country in which we desired to know whether it would be possible to find water, our geological knowledge of the order of stratification would enable us to predict that, after penetrating a certain portion of

porous strata, we should find a bed of clay retaining water, and hence that, by artesian boring, we should procure it; but if, on the other hand, we knew that there was nothing but a great mass of sand, and we were not aware that there was any clayey or other stratum capable of holding up the water, we should know that it would be useless, under such circumstances, to seek for it. In like manner, we should not look for water in granitic rocks. I recollect an instance myself at Fort Henry, in Upper Canada, where there was a great desire to sink a well in the fort. Resort was had to that old expedient, of which, perhaps, all have heard—the turning-stick; and the knowing man having held his stick in his hand, of course it turned round; and at the place to which it pointed it was assumed that water would be found. The authorities were so deeply impressed with the accuracy and certainty of this mode of discovering the presence of water, that orders were given to sink the well. This was in a solid mass of granite; the difficulties were great, and the expense enormous; but who could doubt the infallibity of the stick? Hence, not certainly wisely, though energetically, the attempt was persevered in till it became absolutely necessary to stop: an instance which will show you how important it is to have some little notion of the principles of such a science.

Botany is another science equally charming with geology. It equally takes us to the fields, and it contributes equal sources of enjoyment. We must all bear in mind that soldiers and sailors are generally the pioneers of men of science; they are the first persons who penetrate into new and remote countries, and therefore it is of the utmost importance that they should be prepared to notice the things before them, and to take advantage of their observation of them. The application of botany to practical objects is however not free from difficulties; for example, it requires a certain amount of caution before a conclusion can be formed that a country is likely to be fertile or the reverse. These difficulties are so many proofs to us of the great importance of multiplying observations, and therefore it is that I press upon you, as military men, the great desirableness of not overlooking even botany. Dr. Joseph Hooker says, "with regard to judging of the general character of a country from the aspect of its botany, it can hardly be done directly, though individual botanical traits may prove indications of the resources or capabilities of a country; and I think that military men should be especially cautioned against applying empirical rules to the selection of sites for camping, watering, wooding, or cantonments. I have noticed in my Indian journals how fallacious are appearances, how unhealthy are some of the most open, lovely, timbered, undulating grassy districts, where everything is charming to the eye and senses, and that some of the lowest, hottest swamps of Bengal are healthy districts to a very remarkable degree. I am credibly informed that some of the hill-tops of Penang (a small sea-girt island) are deadly unhealthy, whilst the jungle valleys are salubrious; and I fear we may safely conclude that, in the present state of science, we know just nothing at all of the *rationale* of the healthiness and unhealthiness of countries. Can any fact be more inexplicable than that agues, which prevail in so many swampy districts of the north temperate zone, are absolutely unknown in the south temperate zone? We cannot connect these, and a thousand other facts of the same nature, with either physical geography, geology, or vegetation. It is much

the same thing as regards the productiveness of a country. Twenty years ago any one would have been laughed to scorn who would have declared that tea could be successfully produced as well at the level of the sea, in the hot perennially damp tropical valleys of Assam, in latitude 27°, as in the excessively temperate districts of North-west India, in latitude 34°, at 2,000 to 3,000 feet above the sea; that wheat and oats should be staple crops in the plains of the Ganges; that the grape could be successfully grown and ripened annually at the level of the sea in Ceylon; that as good potatoes, carrots, and cabbages, &c. could be raised at Calcutta as in Europe generally; that rice should be grown on unirrigated hill-slopes at from 5,000 to 6,000 feet elevation in the forest-clad Himalayan ranges; or that coffee should thrive in the dry regions of Arabia and the hot humid forests of Ceylon. From all these cases, and innumerable others which might be cited, the conclusion is that there is nothing in the aspect of the vegetation of a country that would indicate its productiveness. When to this is added, that the most productive countries are often unhealthy for human habitation, or are otherwise unsuited to the operations of man's industry, it becomes evident that the whole subject is a very difficult, and indeed almost impracticable one, in the present state of science. On the other hand, there are often local indications of the productiveness of a country to be gathered from its vegetation in each locality; but this requires a special knowledge of the country and vegetation too. There are Australian judges of good land by certain Australian plants, and Canadians by a certain character of forest, in choosing new sites; but the Canadian's experience will not aid him in Australia, nor the Australian's in Canada, and no longer list of failures could be adduced than are to be found in the records of attempts to apply the local knowledge of one country to another.

"The productiveness of a country depends on its soil and climate, and not on its vegetation; the latter indicates neither soil nor climate, except in extreme cases, or in such gross generalities as that palms are prevalent in the Tropics, and mosses and saxifrages in the arctic zones? Who could have predicated that the sugar-cane would not yield good sugar in Ceylon, or that the *digitalis*, grown in the Himalayas, would prove inert, as is said to be the case? On the other hand, a little knowledge of botanical geography is often of immense use—but it must be sound and not superficial Though the vegetation of a country may not indicate its productiveness, a knowledge of its climate may indicate its suitability for certain crops, and the knowledge of the botany of a place may save an enormous expenditure. It is curious how little of our knowledge of the economic products of our foreign possessions we owe to our army and navy officers. How few of them have introduced a new wood for charcoal, a new timber for artillery waggons, or a foreign substitute for any of the materials used in their arms and other implements. How often do we see 'coals sent to Newcastle,' and under how many shapes, and all for want of a knowledge of common things! When I was in India the government were obliged to send troops and guns to Sikkim, at the foot of the Himalayas, and along with them went hundreds of loads of old bamboos for gun stages and similar purposes. Far better bamboos might have been cut at the very spot to which these were sent, in as many minutes as these took

weeks to transport, and of course at an enormously less expense. I shall never forget the shouts of laughter with which they were received by the European settlers and natives. When they arrived, the Hill Coolies absolutely refused to carry them up the mountains. Hundreds of other similar instances might be cited of loss of time and money occasioned by a want of common knowledge."

Dr. Hooker further says, and I am convinced it is a perfectly just observation, though perhaps some at the present day may not be disposed to admit it, "It is a curious fact that the majority of those military and naval men who have been distinguished for their love of natural history, have also been renowned in their profession; witness, Cook, King, Parry, Ross, Richardson, Franklin, in the navy; and you no doubt can match these names in the army, by such as Eyre, General Hardwicke, and Champion, a capital botanist, who was three times gazetted in the Crimea before he was shot at Inkerman." And he adds, which surprised me certainly, "Also the Duke of Malakhoff and sundry French marshals." This surprised me so much that I asked Dr. Hooker his authority for assuming that the Duke of Malakhoff was a naturalist, and more especially a botanist. He tells me his authority is his father, Sir William Jackson Hooker, who states that the Duke was a frequent visitor at Kew, and that he brought his wife there for her first visit after his marriage. "And, altogether," Dr. Hooker says, "he appeared to possess a scientific knowledge of plants; that is, he knew the scientific names of various plants, and in going through the collection he noticed that there were some deficiencies in the collection, which he afterwards had supplied from Algeria, through the intervention of Prince Napoleon." That was indeed a harmless visit, as no one could suppose that the Duke of Malakhoff went to the gardens for a hostile purpose; though, when he went to the Dorset coast to visit the Kimmeridge Coal Works, all the world supposed that it was to examine the capabilities of our coast for defence, or rather its defects as regards invasion. The truth of the matter was, that he went to examine the extensive works erected for the purpose of quarrying the Kimmeridge coal, and turning to profit the chemical products derived from it. I must say that the exhibition of such a trait in his character was most honourable to him, showing that he is not only an able warrior in the field but is equally distinguished as an intellectual man in time of peace. Marshal Vaillant, the late minister of war in France, is another distinguished example of the union of high military and high scientific qualities; he is a well known and active member of the Institute.

In Entomology, perhaps, it is not so possible to point out many practical applications; but no one can doubt that as a study it is full of interest. We have all been told by a sacred writer to study wisdom from the ant; and insects in general afford ample scope for our study and our improvement. Every country has its peculiar insects, as each has its peculiar plants. The competitive examinations have, I observe, already given to the Royal Engineers one able entomologist, who, whilst he performs his special duties with credit, finds healthy relaxation in his favorite science.

The combination of the organic with the inorganic element gives to geology that endless variety which sheds over it a charm that fascinates the imagination; whilst it has introduced that logical precision

which has raised geology to the rank of an exact science. I have already dwelt upon the remarkable physical phenomena of rocks, which may be studied every where; but, when we turn to the fossils associated with many rocks, a subject of study is opened out to us which is as deeply interesting as any of the various branches of the natural history of still living creatures. I have had a few models of fossil animals placed on the table before you, in the hope that they may excite the interest in your minds which they have done in mine. One of the drawings which I also exhibit represents a great and remarkable flying reptile, the pterodactyle, the largest that has yet been found, measuring, from one extremity of the expanded wing to the other no less than fourteen feet: what must have been the earth's condition when flying reptiles of such a size were flitting through the air, having vast jaws, armed with teeth similar to those of the icthyosaurus, the crocodile, and the alligator? The world, when inhabited by such animals, could have been very little fitted for the habitation of man. On this fact, indeed, may be founded one argument for concluding that man could not have existed contemporaneously with such animals. With all our appliances, and those too of modern origin, we might, by careful watching, manage to kill one of these immense animals in its flight, although its body would afford few spots a ball could penetrate; but in times anterior to the use of firearms, and when men had probably nothing better to defend themselves with than stone axes and flint-headed arrows, how helpless must they have been when opposed to such animals!—the sea swarming with the icthyosaurus and the plesiosaurus, and the air teeming with flying reptiles like the pterodactyle. In a science then of a character so eminently practical there is, as you see, an inexhaustible fund of material to warm the fancy and to exercise the judgment, and that without being denied the blessing of breathing the fresh air on the mountain summit.

On the other branch of my subject I must dwell more briefly. In the experimental sciences, chemistry is a very important one, both as a practical study and with regard to the great views it affords of the laws of nature. When I speak of it as a valuable study, in regard to expanding the mind, I have in view that it is by chemisty we know the extraordinary fact, that bodies unite with each other, not at random, but in definite and fixed proportions. Everybody knows what oxygen is, and also what hydrogen is. Now it is a law of the Creator, that, in order to form water, oxygen shall unite with hydrogen, not in any conceivable but in a definite proportion, that is to say, that eight parts by weight of oxygen shall unite with one of hydrogen to form water. Now this is a fact of extraordinary interest, in every point of view; and, although I had intended to illustrate it by a great many other examples, I will confine myself to one or two. You know that the common substance carbonic acid, is composed of one proportion, or equivalent as it is chemically called, of carbon united to two equivalents of oxygen; and, wherever you meet with carbonic acid, you may be sure that such is its constitution; for if one or more combining proportions were to unite with any other number of combining proportions of oxygen, the resulting combination would differ in all its properties from carbonic acid, and retain the same difference of character in all situations. This law of nature, by which bodies unite only in definite proportions, is as fixed and invariable as the law of gravity, and has as powerful an effect in securing the stability

of all created things; were it suddenly abrogated, all would be chaos again. As an illustration, let me state that oxalic acid, which, as you are aware, is a deadly poison, consists of precisely the same ingredieuts, only united in different proportions, namely, two of carbon to three of oxygen. How easy it might naturally appear to many, to change carbonic acid into oxalic acid, as one proportion more of each constituent would only be required; and yet oxalic acid, and oxalic acid only, is produced in certain plants by natural operations. The Oxalis acetosella is a plant well known to everybody, and yields abundance of oxalic acid; the Rumex and Lichens also produce it. The organic laws imposed upon these plants make them yield oxalic acid, and they cannot escape from their influence and form carbonic acid. Hundreds of other instances might be cited that would give you a high notion, merely in a speculative point of view, of the philosophy of chemistry, and an exalted idea of the wisdom and power of the Creator, who has laid his command on every living thing that it shall manufacture only those things which he has assigned to it to do. The oxalis produces oxalic acid, the sugar-cane sugar, and then again sugar from the cane is different from the sugar of grapes; nor, though the difference is small, could you by any contrivance extract cane sugar from the grape. Cane sugar consists of twelve proportions of carbon, ten of hydrogen, and ten of oxygen; and grape sugar, or glucose, of twelve of carbon, that is, the same proportion of carbon, eleven of hydrogen, and eleven of oxygen, to which are added three of water.

Similar facts might be cited in respect to gums, and many other organic products; but to call forth in your minds that admiration of the wonderful simplicity with which nature works out her results, however varied, I will only contrast the work of the Vine with that of the Acacia. The tissues of the vine afford three equivalents of water, and sugar is formed in the grape; but the tissues of the acacia do not cause water to combine, and gum only is produced, the other components being the same in both. Can anything more be necessary to convince you that the study of such a subject is quite as exalted in character, and quite as valuable in strengthening the mind, and even kindling the imagination, as the study either of languages or of any abstract science?

But there are practical subjects connected with chemistry which it would be wrong to pass over without some notice. You are aware that gunpowder is no modern invention, but the theory on which the proportions of its ingredients are determined is new. Nitre is a substance which was known of old, as were explosive compounds, but whether the properties of gunpowder were gradually deduced from such knowledge, or were discovered by accident, is a question which can hardly be said to be determined. At any rate, the true composition of it was at first very little understood, and in consequencs a great deal of material was wasted in its manufacture and use. Oxygen itself, you must bear in mind, was only first clearly made known in 1774; Hydrogen in 1766; Nitrogen or Azote about the same time; and Potassium was discovered by Sir Humphrey Davy in 1807. Therefore gunpowder, consisting of those primary elements, had been used for centuries before a correct theory of its composition had been established. Now, we know that, theoretically speaking, the mixture ought to consist of 11·9 of sulphur, 13·5 of charcoal, and 74·5 of nitre. These are the theoretical quantities which, after complete combustion,

would produce three equivalents of carbonic acid, one of nitrogen, and one of sulphuret of potassium, so that nothing but the solid sulphuret of potassium should remain.

The modern gunpowder of all nations approximates more or less to the above theoretical or definite compound; but we must not conclude, because an accurate compound has replaced a rude and uncertain one, that in the actual use of gunpowder the military men of early times were unskilled; far from it; there was almost as much skill and ingenuity then shown as we see exemplified now in that great military operation, mining. I will give you two instances, from history, in which mining performed a very prominent part in warfare. In 1672, in the defence of Philipsburg by the French, the siege lasted about four months. The besiegers, from the nature of the ground, had to construct several bridges over the canals which intersected it. The besieged adopted the expedient of floating mines, constructed so as to explode when they came in contact with the bridges. However, this was not a new operation even then, as similar contrivances had been adopted before. Hence, you see, there was no want of ingenuity in the application of the power of gunpowder. The second example is that of the celebrated attack of Luxembourg in 1683. The mining engineer, acting under Vauban, was Goulon. And we know of no modern instance where mines, both offensive and defensive, were carried to so great an extent, and performed so important a part in siege operations. Mines were followed up by counter-mines, mutually attacking and defeating each other, till at last the besiegers' mines were worked up sufficiently to make a breach, one hundred and sixty yards wide, by the simultaneous explosion of sixteen mines, and this was followed by an assault.

But a curious occurrence then took place, for before the French got into the breach they were attacked by a detachment, in flank, of cavalry; a panic ensued, and the French soldiers, who seemed on the point of being the victors, were for a time baffled in their design.

They were not, however, disconcerted; for Goulon immediately returned to his mines, developing them upon the whole front of attack, and had they been exploded a breach would have been formed far too large for successful resistance, except by an army. The besieged, seeing this, knew that any further attempt at defence would be madness, and capitulated. These two examples show us that in those days there was no want of mechanical ingenuity, but at the same time, in points of detail, there were many deficiencies. You must all recollect that the mode of exploding a mine was, until very recently, very clumsy. In the first place the connection with the mine was made by what was called a *saucisson*, or hose filled with gunpowder; this was put into a wooden trough, which extended to the place where it was intended to be fired; a little train of loose powder, covered with a piece of paper, was then laid down, one end in contact with the powder in the *saucisson*, and at the other a piece of match was inserted through the paper; or, when it was thought necessary to explode the mine instantaneously, the contrivance of the monkey was resorted to, which was a sort of little box placed over the powder, into which a piece of burning match was dropped by pulling back a valve or trap in the top of the box by a string extending to a safe distance from it. Notwithstanding the rudeness of this contrivance, as compared with those used at present, sixteen mines were exploded instantaneously in the siege I have

referred to, under the direction of Goulon, by the careful adjustment of the lengths of the *saucisson*, so that a place having been selected for igniting the powder, every branch from it to any one of the several charges should be equal in length, and thereby cause the powder to explode, practically, at precisely the same time. Miners were, indeed, then, as now, aware that the ignition of gunpowder is progressive, though to our senses it may appear instantaneous.

The simple method which I have described of taking this property into account, and causing the ignited powder to travel over the same distance before arriving at the charges to be exploded, was adopted by Vauban, and is even now pointed out in our military colleges, as it is always advisable to be prepared to replace, in a case of emergency, the more refined methods of modern times by the rude, yet ingenious contrivances of our ancestors.

Let me now explain what experimental science has done in improving the methods of exploding mines. Before I do this, however, I will call your attention to a different application of the same power which has been applied to the explosion of mines. Everybody knows that artillery science depends materially on the determination of the velocity of moving bodies, or in this case of projectiles. Formerly this was effected, indirectly, through the instrumentality of a Balistic pendulum, turning upon an axis a little in front of the gun to be fired. When the ball from the gun struck the pendulum it put it into vibration, and the extent of the vibration afforded the means of calculating the velocity of the ball. By this instrument the important results on which Hutton founded his reasonings and calculations were obtained; still it is but a rude contrivance. Now Professor Wheatstone, many years ago—as I can testify to having heard him explain it upwards of fifteen years ago, prepared an instrument for ascertaining the velocity of bodies in motion, such as shot and shells, by the agency of the voltaic battery. This instrument he also applied to measure the velocity of falling bodies. The falling body, the velocity gained by which is to be tested, is placed on a ring, or as we may call it forceps, the top of which is connected electrically with a voltaic battery. When the ring or catch is opened the ball falls, and the circuit being broken by the opening of the catch, an induced current is called into action by the attached induction coil, which at once sets in vibration a clock-like mechanism for recording the time of descent. When the ball impinges on the metal plate below, it descends, and by completing the circuit which had been broken, produces an induced current in the opposite direction, which stops the machinery, when by reading on the dial the number of revolutions the time becomes known.

[This experiment was exhibited several times, and the results when compared together were almost identical.]

This beautiful instrument is called the "Electro-magnetic Chronoscope," and can be applied to the determination of the velocity of projectiles in the following manner.

At definite distances in front of the gun, wire screens, made by carrying wire from side to side of a framework, are placed, and when the ends are connected with a voltaic battery, the circuit is complete. When the ball strikes the first screen, it breaks the wire, cuts off the circuit, and, by

means of the auxiliary coil, induces a voltaic current, which, as before, sets the machinery in motion for determining the velocity; and, again, when it strikes the second screen, the operation is repeated, but in an inverse direction, as the clock-work is stopped, and the time the ball took to pass from one screen to the other is determined, as before, by the number of revolutions marked on the dial.

I can hardly hope to make you clearly understand the ingenious manner in which Professor Wheatstone has secured uniformity of motion in the clock-work, by the use of an elastic musical spring, which is set in vibration by a hand-bellows, and shows by the musical tone it emits that it is so adjusted as to act on the teeth of the revolving wheel in such a manner as will ensure its regularity of motion. Everyone is aware of the intimate knowledge which Professor Wheatstone possesses of the theory of musical sounds; but this application of that knowledge to the regulation of mechanical motion may be said, when combined with the ingenuity of the whole apparatus, and its application to the determination of one of the most important data of gunnery, to be as striking an illustration as any I could have devised of the truth, I before enunciated, namely, that no one can tell the moment when the knowledge he has acquired of even a minute fact in science may become to him a most valuable auxiliary in securing a practical object.

By the kindness of Professor Wheatstone, I am also able to exhibit to you one of his military telegraphs, which is the more interesting as it enables me to explain to you an ingenious method of exploding gunpowder on the same principle, namely, by a purely magnetic apparatus.

I need not detail to you the various contrivances which have been founded on the known fact, that an electric current can and does call into action a magnetic one, and in this way modify or reverse the direction of the needle at will; but in this instrument advantage is taken of the reverse process, and an electric current is produced by the action of the magnetic. Hence the theory on which it depends is called Magneto-electricity and not Electro-magnetism.

The instrument now before you, inclosed in a box of about 1 ft. 6 in. square, contains a very small horseshoe magnet, the armature of which is kept in rotation by the hand and produces a rapid series of currents in opposite directions; the number of these currents is determined by pushing down one of the stoppers which appear arranged in a circle through openings in the case, their action being something like that of the keys of a piano.

Each stop or key is marked by a letter, and on pressing it down, the requisite number of currents is directed into the conducting wire which leads to the receiver at the other station, on the dial of which a magnetic needle points to the same letter. The instrument before you is capable of conveying a message 300 miles, which is as much as would generally be required for military purposes.

One of them is now constructing for Woolwich, another for Chatham, and a third is preparing for the Emperor Napoleon, who certainly has the merit of at once appreciating the value of scientific inquiry and of scientific attainments even in military men. Should it be his intention to take the field, as we presume it is, one of these telegraphs will in all probability accompany him.

The conducting wires are wound round reels attached to a light carriage, and are laid down as the carriage moves forward, whilst a pair of the instruments, also on a carriage, being left at the station of departure, another pair moves on with the army, so that at any moment a message may be sent to the rear or received in front, and this with the rapidity of lightning. Can any one doubt the effect upon military movements of orders thus conveyed at the most critical movement?

The magneto-electric principle exhibited in the instrument I have described is equally applicable to the explosion of gunpowder, thus avoiding the troublesome necessity of carrying about the acids, &c. as must be done in ordinary voltaic batteries. Experiments with that view have been made at Chatham and at Woolwich, and I expect that the machine will be shortly reported upon, and will come into immediate use. The machine used for firing mines is very little larger than this. It is formed of six small magnets arranged in the rays of a circle. The centre is occupied by a metallic plate which turns upon an axis, and at its edge there are attached pieces of metal which form the armatures of the magnet. As the plate is turned round, the armatures come in contact with, and then separate from, the magnets in succession, thus alternately inverting the magnetic circuit, when an induced electric current is on each change forced through the conducting wire, which, aided by the improved fuse lately introduced by Mr. Abel, is found efficient to explode a great number of charges almost instantaneously. The explosion is not absolutely instantaneous, as it may be assumed to be in the electric current from a common voltaic battery, as it is the result of a rapid succession of currents, and, therefore, of an equally rapid succession of discharges. Professor Wheatstone's experiments are sufficient to show that the rapidity of the electric current is equal to about 200,000 miles in a second, being about the velocity of light. French experiments, depending greatly upon the different conducting body which they use, give only half that velocity; still, even assuming the rate 100,000 miles, the additional space passed over by the successive currents in exploding the several charges would be so small as to render any difference in the time of their explosion by the magneto-voltaic apparatus inappreciable; but a well-trained ear can detect that the explosions by the present apparatus are not absolutely instantaneous. It is necessary to use for the explosion of numerous charges subsidiary wires running transversely from one of the conducting wires to the other, or wire proceeding to the earth. By this arrangement, should the electric current not be sufficient to force its way through all the subsidiary wires, it may, at least, effect the explosion of one charge, and that without injuring the main conducting wires, though the single subsidiary wire would, of course, be broken. But as the instrument is kept constantly revolving, and, of course, fresh electric currents and new discharges follow each other with a speed which baffles calculation, the explosion of all may be considered practically instantaneous.

I think these facts are sufficient to prove the immense advance which has been effected in this important branch of mining operations by the union of theoretical knowledge and experimental science. And if it be said by military men, as I know it is said by many, that they are unable to compete in scientific matters with such men as Wheatstone, I readily

admit that at present they are not able; but at the same time I must remark, that, in almost all continental armies, many of the most important discoveries in science have been made by military men: and of this fact I have given you an example in the invention by Captain De Brette of a form of chronoscope, the merit of which in Professor Wheatstone's opinion is considerable, although its inventor as a military man could only devote to scientific pursuits the leisure time which every military man possesses. It certainly is an advantage to all military men, particularly those in the corps of Artillery and Engineers, to possess a description of knowledge which awakens their faculties, and excites them to overcome difficulties, to avoid bungling arrangements, and to introduce improvements. It should, however, be an object in the education of military men in general (and not confined to the education of officers of particular branches of the Service, such as the artillery and engineers), to render them observing and intelligent men.

Let us remember that some of our greatest improvements in fortification, and some of our greatest improvements in many other military subjects, have been due to men in other arms of the Service. I say, indeed, is it not common sense to suppose that if every military officer had paid attention to some particular branch of science, and brought his mental powers to bear upon it, new improvements, and new inventions, would be frequently occurring to some one or other, without waiting till a great philosopher like Wheatstone, or a mechanician like Armstrong, had pointed out their advantage, and proved their absolute necessity?

I conclude, therefore, with a fervent hope that I have proved my statement, that the officer or soldier who has been instructed in any branch of the natural or experimental sciences carries with him an endless spring of enjoyment which no sensual pleasures or dissipation can afford, and at the same time his mind has been so invigorated, and so stored with facts of the widest practical application, that he will be armed with a new power, and be able to triumph over difficulties and dangers under which he would otherwise have been crushed. I here, therefore, conclude my Lecture, thanking you most warmly for the patience with which you have listened to me.

NOTE.—I am aware of the difficulty of making the subjects noticed in this Lecture fully intelligible without the aid of complex and costly illustrations; but at least I have said enough to render any reader cognisant of the results attained. I have pointed out one remarkable instance in which the perusal of Polybius in the original Greek afforded solace to one Crimean hero, my respected friend Major-Gen. Cameron, C.B., which he would not have obtained from simply reading a translation. The language itself was a source of enjoyment to the Scholar, in addition to that derived from the historical details. I ought to have added a Crimean proof that other officers found an equally powerful cordial in their pursuits of natural science, under what may indeed be called difficulties. My friend Mr. W. Baily, F.G.S., has described with much ability the fossils collected in the Crimea and placed in his hands by Capt. C. F. Cockburn, R.A., besides whom, I observe noticed in the list as having shared in the labour, and let me say the pleasure, of collecting them, Major Cooke, R.E.; Major Hudson, 39th Regt.; Dr. Sutherland, Sanitary Commission; Mr. Olver, Army Works Corps; Lieut.-Col. Munro; Dr. McPherson; Major Anderson, R.A.; Lieut.-Col. Lygon Cocks, Grenadier Guards. Had the number of collectors and observers been greater, the amount of happiness would have been greater also, and that without inducing any diminution of the military zeal or efficiency of the officers themselves.—J. E. P.

Friday, May 13th, 1859.

LIEUT.-COL. T. ST. LEGER ALCOCK, Vice-President, in the Chair.

GUN-LOCKS AND THEIR HISTORY.

By Mr. ROBERT T. PRITCHETT.

ALTHOUGH there are many to whom this subject would afford but little interest, yet all who have ever looked with pleasure on a gun must allow that no part is more worthy of our attention than the lock, or mode of ignition.

From the earliest periods up to the present, the lock has even given a distinctive name to the different arms, and in the present day they are alluded to as percussion guns, tube guns, or the flint, which is sometimes disrespectfully treated by the term "tinder box." The lock just now deserves our notice; the more so as likely to prove but a minor characteristic before the all-engrossing topic of muzzle-loader, or breach-loader. My chief endeavour will be to bring before you authentic specimens; I shall also endeavour to show when the different systems were used in the British army, and throughout to trace the various links that exist, particularly when, from want of confidence in a new system, the old one has been retained and used in the same lock.

We have four distinct systems, which may be thus described:—

Match-lock,	or ignition	by simple application.
Wheel-lock,	„	friction.
Flint-lock,	„	scintillation.
Percussion,	„	detonation.

These have all in their turn been used in our army in their simple forms, as described in the following table, the compounds having been made use of only for sporting purposes and "armes de luxe."

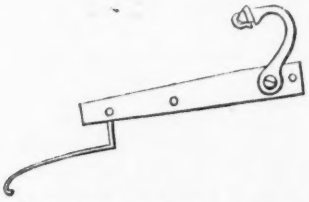
DESCRIPTION OF LOCKS USED IN THE BRITISH ARMY.

DATES OF LOCKS.				
Reign.	A.D.	Musket.	Carbine.	Pistol.
Edward IV.	1461	Hand Gonnes introduced into England.		
Henry VII.	1485	Match	—	
Henry VIII.	1509	Match	—	Wheel
Edward VI.	1547	Match	—	Wheel
Mary	1553	Match	—	Wheel
Elizabeth	1558	Match	Wheel	Wheel
James I.	1603	Match	Wheel	Wheel
Charles I.	1625	Match	Snaphaunce	Wheel
Charles II.	1660	Match	Snaphaunce	Wheel
James II.	1685	Match	Flint	
William III.	1689	Match	Flint	
Anne	1702	Flint	Flint	Flint
George I.	1714	Flint	Flint	Flint
George II.	1727	Flint	Flint	Flint
George III.	1760	Flint	Flint	Flint
George IV.	1820	Flint	Flint	Flint
William IV.	1830	Flint	Flint	Flint
Victoria	1837	Percussion	Percussion	Percussion

I need hardly mention here that the first hand "gonnes" had no locks, but were fired as hand cannons, and only at the latter end of Henry VI.'s reign had they the addition of the side touch-hole, pan, and cover.

The MATCH-LOCK was long-lived in the service, from 1485, when Henry VII. first armed half his yeomen of the guard with them, to William III. in 1689. In Mary's reign it was left to the people to find themselves guns or bows as they preferred.

The first form of match-lock was very unsophisticated, as seen in some old specimens of about the time of Elizabeth or Henry VIII. Two very fine ones are now in the Tower, which were presented by Lord De Lisle from Penshurst.



In a work called "England's Training for a Private Soldier," by Davies, 1619, page 121, Grose, vol. ii., we find, that the "match be carried between the fingers." In Captain Cruso's work, in 1632, the dragoon is directed to carry "the match burning, and the bridle in the left hand;" and in Rushworth we learn that the musketeers, when surrendering at Reading, in 1644, were "to march out with the match lighted at both ends, and their bullets in their mouths." Later again, in 1670, General Monk still thinks match-locks so important as to recommend (see page 132), "that the governor of a fortress be careful to sow at a fit time of year a competent quantity of hempseed for the making of match." One peculiar form of match-lock, bearing the date 1562, is well worth our notice; I have therefore made a sketch of it, as being the first form of relieving the cock with a spring with which I am acquainted. (See plate, fig. 1.*)

In this early instance the serpentine is drawn back to full cock, and to fire the gun, the match, as soon as the cock is relieved, is dashed down into the pan; there is no doubt, however, that, instead of igniting the priming, it frequently pushed the powder out without igniting it, and extinguished the match as well. There is a marked difference between the Eastern and European match-locks; in the former the match comes down towards the muzzle, in the latter towards the butt. The match-lock, with all its simplicity, gave considerable trouble in its use, as the following words of command will show, thus:

* It is curious to observe that matchlocks from Borneo and Java have the same arrangement of spring.—R. T. P.

Fig. 1. Match Lock 1562.

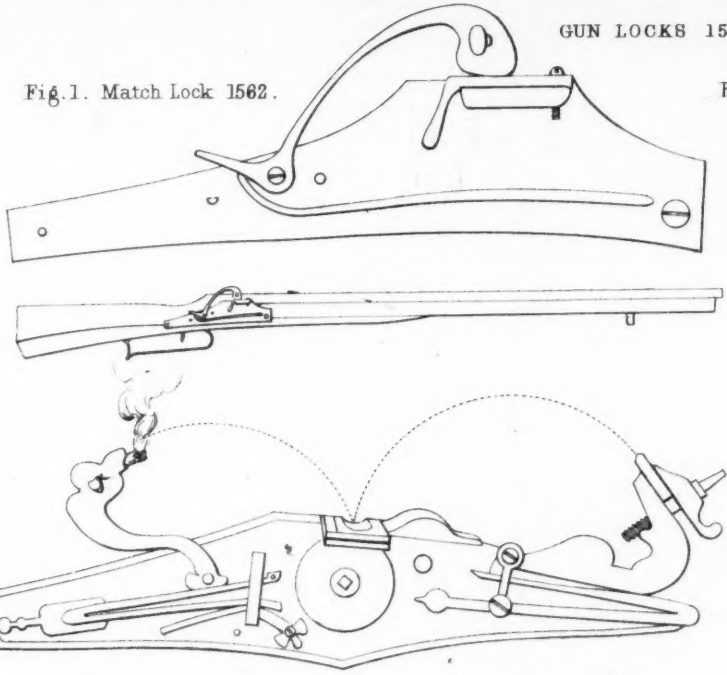


Fig. 2. Wheel Lock 1590

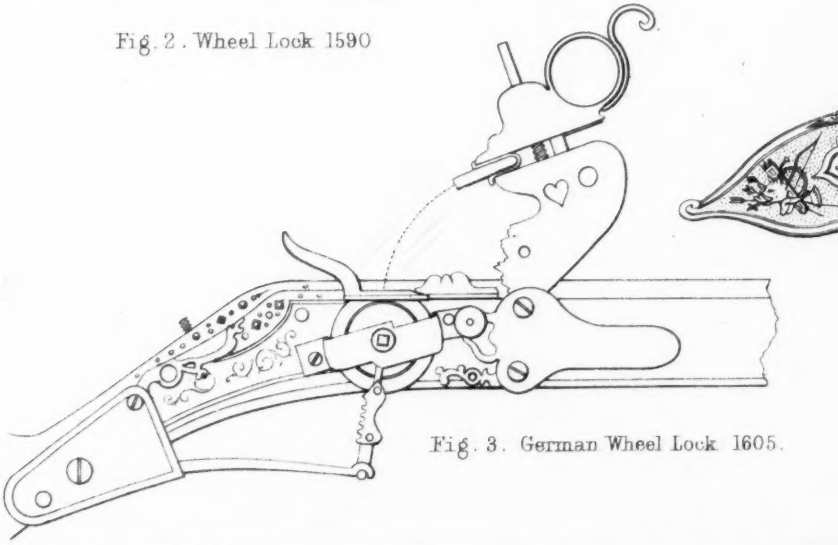


Fig. 3. German Wheel Lock 1605.

Fig. 4. Fl
Match

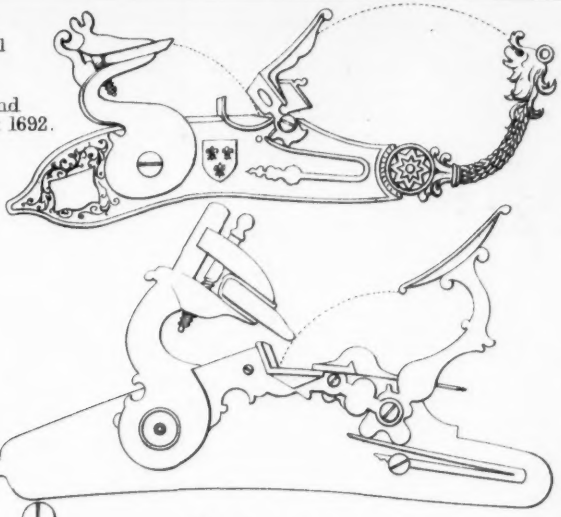


Fig. 4. Flint and Match Lock 1692.

Fig. 5. Snaphaunce

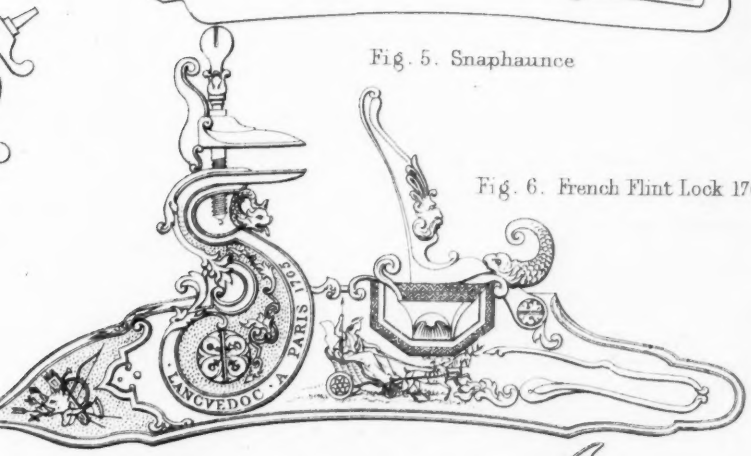


Fig. 6. French Flint Lock 1705.

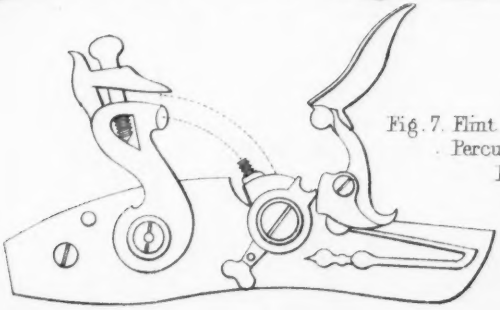


Fig. 7. Flint and Percussion Lock 1821

1605.

J.R.Jobbins

Words of Command for

Match, 1630.	Wheel, 1632.	Snaphaunce, 1632.	Flint, 1745.	Percussion, 1853.
Take forth your match. Blow off your coal. Cock your match. Try your match. Guard, blow, and open your pan. Give fire. Uncock your match. Return your match. Clear your pan. Prime your pan. Shut your pan. Cast off your loose powder. Blow off your loose powder. Draw out your match.	Span your pistol. Prime your pistol. Shut your pan. Pull down your cock.	Bend your cock. Guard your cock. Prime your hammer. Fire your cock.	Half cock your firelock. Handle your primer. Prime, 1. Prime, 2. Shut your pan. Cock your firelock.	Half cock. Two, i.e. cap. Ready, i.e. full cock.

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Match, 1630.	Wheel, 1632.	Snaphaunce, 1632.	Flint, 1745.	Percussion, 1853.
Take forth your match. Blow off your coal. Cock your match. Try your match. Guard, blow, and open your pan. Give fire. Uncock your match. Return your match. Clear your pan. Prime your pan. Shut your pan. Cast off your loose powder. Blow off your loose powder. Draw out your match.	Span your pistol. Prime your pistol. Shut your pan. Pull down your cock.	Bend your cock. Guard your cock. Prime your hammer. Fire your cock.	Half cock your firelock. Handle your primer. Prime, 1. Prime, 2. Shut your pan. Cock your firelock.	Half cock. Two, i.e. cap. Ready, i.e. full cock.

The second word of command must have been rather inconvenient to any one in the immediate neighbourhood. A cigar ash is dangerous to the eye; but 100 musketeers, all "blowing their coal," must have been frightful for any one to leeward. The match, when lighted, was very objectionable, as being likely to betray the bearer: to avoid this, the match was carried in a pewter case with holes [o o o o o], and, to avoid the shot of the enemy, the infantry of the period were instructed to "fire going, and never standing;"—so advises Mr. William Garrard in 1587. The last guns of this sort used in the army are ably represented in many museums. There is a very good specimen of the time of William III. in the valuable collection of this Institution.

WHEEL-LOCKS were used as early as 1509, in the reign of Henry VIII. and were in origin Italian, as the Duke of Tuscany had a very splendid and elaborately-worked pair of pistols, dated 1530; and Benvenuto Cellini, about 1523, speaking of his gun and lock, leads us to suppose it to have been a wheel-lock.

The German reiters next attract our attention, by having, in 1545, wheel-lock pistols. In Mary's reign, in 1553, wheel-lock pistols were used for our cavalry; but I am not aware of any instance in which our soldiers had muskets on this principle. In 1558 Collado, in "A Treatise of Artillerie," published in Venice, mentions that they were in use before his time, and we find them continued in our cavalry until snaphaunces were gradually introduced in Charles I.'s reign. In France they were used until 1680; and in Germany sporting rifles were made on this principle until the end of the last century. The action of wheel-locks cannot be better described than by the following instruction for "Cavalrie" of the period:—"Span your pistol," which is, to turn the wheel with a spanner until it catches or stops. Then to prime, "Draw over the pan-cover," "Pull down the cock;" the pyrites resting upon the wheel, which comes through the pan. Directly the trigger is pulled the wheel flies round, and, drawing sparks from the pyrites, ignites the priming, the same action as "scissors to grind," but reversed in the wheel-lock. In the former the steel revolves, in the latter the steel is stationary. A very beautiful specimen of this work, of the time of Louis XIII. shows how art was encouraged in the manufacture of arms about this period, and to what a great extent it was carried; and only a short time since I saw a wheel-lock, equally beautiful, dated 1590, which had been altered from wheel-lock to match. In 1639 Ward speaks in praise of these locks in the following words:—"That they are not likely to get out of kilter, and will endure spanned twenty-four hours together without hurt." In Germany, about the year 1600, they were rather fond of making their locks with a huge mechanism outside, cumbersome in the extreme, and the spring sadly exposed, as shown in one of my specimens, which was in the Bernal Collection. (See plate, fig. 3.) Some cases are found where two cocks were used to one lock, in case the first missed; in others, again, we find the lock as shown in plate, fig. 2, where the match is retained, lest the wheel should ever fail: these date about 1590.

The term tricker-lock, about the time of Charles I. in 1633, is particularly mentioned in the gunmakers' rate. It means this—a hair-trigger, as now known to us.

We now arrive at the FLINT-LOCK, the lock of that gun, with which our great battles have been fought, with which Marlborough and Wellington gained their great victories, the days of which, added the names of Blenheim, Ramillies, Malplaquet, Peninsula, Assaye, and Waterloo, to the laurels of this country. Flint and steel (as connected with gun-locks) were known for a hundred years before they were adopted in the Service. This may seem a remarkable fact; but in the "Norfolk Archæologia," * a blacksmith is mentioned as fitting a snaphaunce to a stock in 1588. Now the snaphaunce (see plate, fig. 5,) is really a flint-lock, although we do not accept it as such until the bottom of the hammer covers the pan. The earliest specimen bearing a date is a gun in the possession of the War Department, having the year 1614 on the lock and barrel. This belonged to Prince Charles. The stock is inlaid with silver thistles and Scottish designs, the barrel shows symptoms of being inlaid with gold, the whole forming a good historical relic. A notice of it was read last Friday at the meeting of the Archæological Society. In 1632 (time of Charles I.) snaphaunce carbines were the cavalry weapon. That period is to be particularly remembered as one at which match-lock muskets, wheel-lock pistols, and snaphaunce carbines, were all used at the same time in army.

In 1677, the Earl of Orrery gives five reasons why fire-locks were superior to match. "1st, more ready, the match being more roundabout; besides that, if not fired as soon as the match be blown, you must a second time blow your match, or the ashes it gathers hinders it from firing. 2nd, the match is very dangerous, either when bandeliers are used, or when soldiers run hastily in fight to the bridge barrel to refit their bandeliers. I have often seen instances thereof. 3rd, matches are seen at night. 4th, in rain, the pan being open for awhile, the rain often deads the powder and the match too, and in wind blows away the powder before the match can touch the pan, or else blows sparks into the pan, and fires the piece before the soldier is ready, who either thereby loses his shot, or wounds or kills some one before him, whereas the fire-lock [the term fire-lock is now given to the flint-lock] is so sudden, that what makes the cock fall upon the hammer strikes the fire and opens the pan at once. 5th, the store of match for an army adds so much to the baggage, and it is liable to get spoiled by the weather." In 1682, Charles II. (see Abridgement of the English Military Discipline, by his Majesty's command), the musketeer has a match-lock musket, the dragoon a flint-lock musket. In 1690 the musketeer has a match-lock, the grenadier a fire-lock. In 1685, at the coronation of James II., the guards are described by Sandford, in his elaborate description of the proceedings, as having "snaphaunce musquets."

The specimen in the Museum, bearing the initials J. R., shows that the reign of James II. may fairly be considered as the commencement of adopted flints, connected with which system is the doglock catch at the back of the cock. The reign of William and Mary, in 1690, brings us to the time when the last match-lock musket is made; and the battle of Steinkerque gives rise to a remarkable lock known as the *Vauban* lock,

* Norfolk Archæologia, p. 16, "1588 A.D. Payde to Henry Radoo, smythe, for making one of the old pistols with a new snaphaunce and new stock at Norwich."

and adopted in the French service. The drawing (see plate, fig. 4) I have taken from St. Remy, a most valuable authority for his period, about the year 1702. In this work the lock is described as the fusil-musket lock, because the flint was first applied to fusils; it was afterwards applied to the musket. In the Musée d'Artillerie at Paris, they describe the lock thus: "Fusil mousquet de Vauban qui au mécanisme ordinaire de ..... a batterie reunit le serpentin pour la mèche. A la bataille de Steinkerque (1692) les François jetèrent spontanément leurs mousquets, pour se servir des fusils pris aux ennemis. Ce fut alors que Vauban imagina son fusil mousquet, dans lequel la mèche sert au defaut de la batterie." The flint had not gained much ground in France at this period, although in the Spanish army it had been long used and known as the Platine à Miquelet. I may mention that a photograph of the Vauban lock has been kindly sent to me by the Minister of War in Paris,—an attention which I esteem highly. Without paying too much attention to the affairs of our Gallic neighbours, I may mention that from 1693 to 1714, a series of experiments with flint-locks was being carried on in France. In 1703 many flint-locks were in service, and the exquisite specimen dated 1705, made from designs by La Collombe, (see plate, fig. 6,) in my own possession, shows that in Paris they were no mean proficients in flint-locks; yet no model was adopted in the French service until 1714. From that time the French Government has made a complete series of model arms and their transformations up to the present date. In Queen Anne's reign a change took place in flint-locks so as to strengthen their form of construction; it was to carry the pan further through, so that the hammer-pin might be better supported. From this time up to 1837 no change took place. About 1772 Thomas Wright and C. Byrne produced a flint-lock which was self-priming, and self-hammer-closed; the patent can be seen by referring to No. 1,003 in the Collections of Patents on Locks. Cock-and-hen locks are alluded to in the patent Nov. 28th, A.D. 1799. Flint-locks are mentioned as being made so that the flint, by the operation of cocking, presents a different angle to the hen or hammer every time the piece is fired.

The very name of PERCUSSION seems so identified with our own day, that in fact it is almost too well known to require explanation. Cock your gun, cap, and fire, explains all; a few words as to the origin of the principle are, however, desirable. For its invention, like that of gunpowder, we are indebted to an ecclesiastic, viz. to Schwartz, the monk, for the latter, and to the Rev. A. J. Forsyth for the former. In 1807 Forsyth took out a patent to explode the charge by a grain of detonating powder. In 1816 Joseph Manton took out a patent for tube guns, which are still used; and in 1821 Samson Davis took out another for using the same lock, either on the percussion principle or with gunpowder, without changing the cock or hammer. The original of this patent may be seen in the collection in the Museum, and I regret that, as a left-hand lock is there, I have not been able to obtain a right-hand one as a fellow, in order to complete the pair.*

It was not until 1837 that the percussion principle assumed such a form as to be worthy of adoption in Her Majesty's Service. At first some

* A right-hand lock has since been placed in the Collection. (See plate, fig. 7.)

special arms were got up for the Foot Guards, with back-action locks, at the same time that some old arms were altered from flint to percussion. These being found satisfactory were continued in use for some time. A back-action carbine, known as the Victoria Carbine, the same as that now carried by the Horse Guards, was also adopted at that time. But, although the percussion principle was adopted in certain corps, and in the Brunswick Rifle for the Rifle Brigade, yet not until 1842 was a percussion model decided upon for the Army, or rather for the Line. This arm had not a back but a bar action. This remained the weapon of the Line and East India Company's Army until 1853. One great defect stamped the Line lock of 1842, viz. the shortness of the mainspring, which produced a very cramped action. There was also the radical fault of a hook-mainspring instead of a swivel. When the wheel-lock fell into disuse, the swivel that used to connect the mainspring with the tumbler was forgotten and ignored. So great is the difference of action between a swivel and hook-mainspring, that the former may be put together dry, and it will work easily and smoothly, whilst the hook-mainspring, unless put together with oil, will immediately grind; and so in fact it will always, unless kept constantly lubricated.

We have now reached a period when the experience of centuries has produced a satisfactory result in the lock of 1853, the pattern lock of our Service, which in simplicity deserves our praise, and in production our wonder. It will be superfluous to take up your time in detailing the processes of manufacture. I will only draw your attention to that most interesting collection in the Enfield rifle room in this Institution, where you may trace the gradual production of the different limbs and pieces from the raw material up to the highly-finished and perfect lock. The stages of fabrication, though numerous, are very interesting and very instructive.

Friday, May 20th, 1859.

Colonel the Hon. JAMES LINDSAY in the Chair.

ON ROTATORY MOTION APPLIED TO OBTAIN STABILITY FOR ASTRONOMICAL OBSERVATIONS AT SEA.

By the Rev. BADEN POWELL, M.A. F.R.S., &c. Savilian Professor of Geometry in the University of Oxford.

ABSTRACT.

THE subject of rotatory motion is one of large extent when considered in reference to the principles of theoretical mechanics, and is connected with some of the most abstruse theories of analytical dynamics. Yet some of its simpler properties, laws, and results admit of direct experimental demonstration, and such elementary ideas of the subject as can be thus communicated are fortunately quite sufficient for the full comprehension and elucidation of some of the most important and valuable practical applications of the principle.

The object of the present Lecture is restricted to the explanation of one or two of such applications which are interesting, and promise to be of considerable practical importance to nautical astronomy in supplying the means for attaining that much-desired object, a stable support applicable to the purposes of astronomical observations on board ship.

In order to render the description of such inventions intelligible, it will be necessary first to advert to one or two theoretical points involved in the nature of the constructions.

The principle of "the composition of rotatory motion" is one of fundamental importance for the explanation of nearly all phenomena of the kind we are considering. It is susceptible of very simple and elementary illustration. If we merely consider the familiar case of composition of rectilinear motions, a body moving by a force which would alone carry it through a given space in a given time, acted upon also by another force, which in the same time alone would carry it through a space in a direction transverse to the former, will, under both, in the same time, describe a space which is the diagonal of the parallelogram of which the two former are the sides.

In like manner, if a body be rotating about an axis, a point in its circumference describes in a small interval of time a small arc, which may be regarded as rectilinear; if a force act on it which in the same time would cause it to rotate in another direction, or to describe a small arc transverse to the first direction, it will, under both, describe the diagonal of the small parallelogram.

In order that the small arc of the circumference may take this new position, it is merely necessary that the axis should take a new direction,

or the plane of rotation of the whole body should shift into a new position, without any change in its inclination to a given fixed plane.

This is the actual case of the earth's rotation as affected by the attractive force of the sun and moon tending to pull down the protuberant equatoreal matter of the terrestrial spheroid into the fixed plane of the ecliptic or earth's orbit, giving rise to that slow shifting of the direction of the earth's axis, which carries with it the equinoctial points or intersections of the equator with the ecliptic, without the smallest change in the inclination of the one to the other, and which is the explanation of the well-known phenomenon, the precession of equinoxes.

Hence, in the general case of compounded rotatory motions the resulting effect of this kind is called a "precessional motion." Of this we have many practical instances, especially in the constructions about to be described.

It is also necessary to explain the term "axes of rotation." If any body of whatever form be forcibly struck, it will acquire, besides the general motion of translation, a rotatory motion, unless the stroke happen to be directed exactly through its centre of gravity. There is always some one line passing through it, about which it will for the moment be rotating as an axis; but in general this direction will be perpetually changing, until the rotation at length becomes permanently settled about some line related to the figure of the whole mass, which is termed one of its "principal axes." It can be demonstrated that every body has at least three such axes, and in regular figures their position can be determined.

The principle termed "the constancy of the plane of rotation" is evinced in this, that a heavy body rotating about its principal axis shows a powerful tendency to continue its rotation about that axis, in the plane in which it was originally impressed, so much so as to offer a very forcible resistance to any attempt to give it while rotating any inclination out of that plane. This is most conspicuously displayed when the rotating body is mounted on gymbals, so as to be free to turn in any direction.

To occasion this tendency there is, besides the mere inertia, the law of permanent rotation about a principal axis, and the composition of rotations, from which any small tendency to change of direction would not show itself directly, being compounded with the original rotatory force.

These, and a variety of other analogous and related phenomena, are conveniently exhibited by the small apparatus now generally known under the name of the "Gyroscope," originally devised by Bohnenberger, and described by him in 1816, and since largely improved upon by various other mechanists, until it has received its most complete form from the improvements of Professor Wheatstone, in 1854. While for more specific purposes it has received a different construction in the beautiful adaptation of M. Foucault, in 1854: the idea of which was, however, suggested by Mr. Sang of Edinburgh so long ago as 1836.

These preliminary considerations will prepare the way for the elucidation of that remarkable practical application of the principle of rotatory stability which is the specific object of the present Lecture, the means of affording a stable platform for astronomical observations on board ship, exempt from the motion of the vessel.

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These preliminary considerations will prepare the way for the elucidation of that remarkable practical application of the principle of rotatory stability which is the specific object of the present Lecture, the means of affording a stable platform for astronomical observations on board ship, exempt from the motion of the vessel.

It is true that for some of the most ordinary, and at the same time most important, operations of nautical astronomy, this stability, owing to the happy invention of Hadley, is not needed.

But there are other classes of observations which it is highly desirable, if not necessary, to make at sea, for which this principle of stability is absolutely essential. Nay, even for the ordinary purpose of measuring altitudes, there are continually occurring cases when the sea-horizon cannot be discerned, while the sun or star is clearly seen above. Hence some means of obtaining an artificial horizontal level becomes of great importance, but unattainable by those means so easily practised on land, by reason of the motion of the ship. Hence, with only this limited, but important, object in view, various plans have been devised; and of these one of the most hopeful was derived from the principle of rotatory stability. The commonest observation showed how easily such stability (in a general sense) was acquired by the mere spinning of a top: and, though many other considerations were really involved, not at first fully apprehended, yet the general idea seems to have presented itself more than a century ago to the inventive mind of Mr. Serson; at least, as far as seems at present known, this is the earliest attempt of the kind on record. The invention consisted essentially in a circular plane reflector through the centre of which an axis passed, the lower part of which terminated in a steel point resting in a hemispherical cup of agate: on the upper a string could be wound by which it was spun; as the support moved with the ship the point shifted its position in the cup, always tending to the lowest point, and thus a nearly horizontal rotation was attained. A brass rim round the reflector descended so low as to bring the centre of gravity of the whole nearly into coincidence with the point of support. If this coincidence had been exact, the instrument would have been more perfect, theoretically, than some since made.

An account of the instrument will be found in Brewster's Cyclopædia, art. Sextant, with a figure. A shorter account is given in Rees's Cyclopædia, art. Horizontal Speculum.

The inventor went on board the Victory in 1744 to try the plan. In this ship (of 110 guns and 1100 men) he was unfortunately lost, when it was totally wrecked by striking on a reef off Alderney in the night.

In the Phil. Trans. 1751–2, there is a paper by Mr. James Short, who speaks of the invention as well known. He also states that this top when spun took "the true horizontal plane," and was not disturbed by any motion or inclination given to the box in which it is placed; and thus "may be proper to be used aboard ship" for taking altitudes.

Mr. Short's object was to try whether (as had been suggested) the air had any share in causing this horizontality. He therefore tried spinning it *in vacuo*; and observed that, while in air it kept up 36 minutes, *in vacuo* it continued spinning for 2 hours 16 minutes, "preserving a perfect horizontality for three quarters of an hour."

Owing to whatever cause, however, the invention of Serson seems to have fallen not only into disuse but into oblivion. Some plans on exactly the same principle have been proposed more recently, apparently without any knowledge on the part of their inventors of Serson's priority. But it does not appear that any material improvement in the performance has been attained.

Another invention, that of Mr. Weir, some years later, differed from Serson's only in making the centre of gravity fall below the point of support. This, as we shall presently see, was an error.

Apparently without any knowledge of what Weir or Serson had done, a machine of exactly the same kind was independently devised and constructed by the late Mr. Troughton in 1820. It consists in causing a disc, truly balanced on a fixed pivot, to spin round with great velocity, so as to keep up its motion during the time required for an observation, known by the name of "Troughton's top." The disc carries a plane reflector on its upper surface; and, being a cylinder hollowed out at its lower end, and the point of support within, the centre of gravity is thrown below, so that it is in stable equilibrium when at rest. The velocity is communicated by a separate train of wheels, from which it can be instantly detached. Thus set going it would acquire a momentum which would keep it steadily rotating uninfluenced by the motion of the ship. Such at least was the expectation formed from the acknowledged "stability of rotation."

It may be proper here to observe, that, simple as this idea was, the practical application of it involved several instances of those mechanical resources which its inventor could so readily supply. One of these (of importance in all similar instruments) is the means of obviating the unavoidable inequalities of density in different parts of the most accurately cast metallic disc, as well as defects in accuracy of form, which affect the perfect equilibrium. These were remedied by plugs, or small pieces of metal, screwed more or less deeply into holes made for them at opposite parts of the circumference, three vertically and three horizontally placed, by which, in successive trials, a complete compensation was effected.

The method was, however, practically found to fail. But the cause of failure was by no means understood at the time, nor indeed till some years afterwards, when it has been satisfactorily traced to another mechanical principle. The pivot partakes in the irregular motion of the ship. When the disc is not revolving, this motion is in turn communicated to the disc; and the centre of gravity being below—the very circumstance which gives it stability on land—causes it to acquire an oscillatory movement. When in rotation, this does not show itself directly, but is compounded with the rotation, and causes a precessional motion, which is fatal to its use as a horizontal reflector, as at once appears from considering the principles of rotation at first laid down.

At the same time there were, no doubt, cases under peculiarly favourable circumstances when this plan might be resorted to. So much, however, was the want felt of a method which could be generally relied on, that several other schemes, not dependent on rotation, were successively proposed by naval officers and men of science for obtaining an artificial horizon at sea.

Of such inventions (including those of the late Admiral Beechy, of a glass floating on mercury, of Mr. Fallowes by a vessel of mercury suspended from the sextant, and others,) it would be hazardous to speak without reference to actual experience; but it is believed that, though several such plans have been recommended by professioual authority, and may be occasionally available under particular circumstances, yet most of

them have been found in some way inconvenient or inefficient for general use; and the cause of failure might in several instances be traced to mechanical principles now better understood than formerly, especially where the principle of suspension is involved, as just explained.

Thus the thoughts of inventors were again turned to the fertile principle of rotation, and, on reconsidering more attentively the causes of failure of the top of Troughton, as arising from the pendulous oscillation, it became evident that to remedy this difficulty we might cause the centre of gravity of the disc to coincide with the point of support, as would be readily done by suspending the revolving disc with its axis and pivots in rings constructed as gymbals, in the manner of the gyroscope of Bohnenberger already alluded to, and thus this cause of irregularity would be avoided.

Having thus the principle of a stable plane secured, still it would remain to bring it to the true horizontal direction, or at least to have the means of determining that direction or the deviation from it.

To this object accordingly Professor C. P. Smyth's attention was directed. Several modifications of the spirit-level had been suggested for this object; but the sound principle of its application was soon seen to be attainable by a simple combination of mechanical and optical means, whence Professor C. P. Smyth was at length led to a very simple, complete, portable, and efficient construction.

As this construction itself is of an optical nature, and not connected with rotation, it would be foreign to the present object to describe it in detail; but we may just mention that it consists essentially in the bubble of a spirit-level reflected from a diagonal mirror above it, seen through a collimating lens, so adjusted that in one inclination the apparent position of the bubble coincides accurately with the true horizontal direction, whence it is easily demonstrated that in every other inclination, within certain small limits, the apparent place of the bubble will deviate from its former place by the same angle as that by which the base is inclined, or will in all positions give the true horizontal direction, the level-tube being bent into a small arc of a circle, whose radius is equal to the principal focal length of the lens.*

Such an instrument being supported on the perfectly balanced rotating disc, into which we have supposed Troughton's top converted, the observer will be thus furnished with a direct view of the true horizontal point with which the image of the sun or star can be brought into coincidence in the usual way with the sextant.

But for other classes of observations on board ship, which involve the direct use of the telescope, especially where one of considerable power is requisite, the condition of invariable stability is yet more necessary, though hitherto unattained.

One of the most important instances of such observations are those of the eclipses of Jupiter's satellites, which it is well known afford so ready, easy, and accurate a method of obtaining the longitude, but hitherto found inapplicable at sea from want of the means of mounting a telescope so as to be free from the motion of the ship.

* This contrivance has been fully described in the Notices of the Royal Astronomical Society, vol. xviii. p. 65, Jan. 1858; it was also exhibited at the Paris Exposition in 1855, and described in a printed notice.

Attempts, however, to attain this object have not been wanting. Indeed the suggestion seemed obvious of some means of this kind, arising out of methods commonly practised on board ship, for giving a kind of stability required for the ordinary purposes of life, such as suspending a table on slings, by which it is, in a certain sense, rendered comparatively steady, so that articles keep their places on it; for example, a glass of water placed on it does not spill.

This effect, however, when more carefully considered, is seen to be only one of the same kind as the common experiment of whirling a vessel of water over the head without spilling; the surface of the water keeps perpendicular to the string, not parallel to the horizon.

When we consider the case as to its mechanical conditions, it readily becomes apparent that a body thus suspended is like a plumb line, when the point of support is itself set in motion it acquires a part of that motion, and from a plumb becomes a pendulum; and it oscillates more irregularly and violently from the accumulation of motions impressed upon it continually by every fresh motion of the ship. The case is the same as that just considered in Troughton's top, but here distinctly displaying itself without any concealment from compounding with other motions.

The invention, which formerly obtained considerable celebrity, called Nairne's or Irwin's "Marine Chair," for carrying the observer and his telescope, was simply an application of this principle. It was tried on board ship, especially in a voyage to the West Indies, by the late Dr. Maskelyne; and, though somewhat prematurely rewarded by the then government, was found not to answer, though no one seemed fully aware of the cause of its failure till Sir J. Herschel (in the "Admiralty Manual") pointed out the principle just stated, and showed that this free suspension must tend to increase and perpetuate disturbances rather than destroy them.

In these cases the centre of gravity is below; this is what constitutes the table or chair a pendulum. If it were suspended in gymbals, so that the centre of gravity should be at the point of suspension, the tendency to oscillate from this cause would be overcome; but still any slight cause might disturb the level; there would be no principle of permanent stability, or tendency to restore the equilibrium when lost.

Yet that, under occasional and very favourable circumstances, this, or any like plan, might be found available, it would be difficult positively to deny. It has, in fact, been alleged that observations have sometimes been effected in this way; but we must suppose that it can only have been in the hands of peculiarly skilful observers, and that the case is quite exceptional.

We have noticed the causes of failure in several apparently promising suggestions for attaining the desired stability; we have also hinted generally at the channel through which a better expectation appears to be opened. To produce this desired stability for a plane or stand on which the telescope is to be rested, we must have recourse to the free revolving disc accurately balanced within gymbals on its centre of gravity. But in following out the details of such a construction there are many points to be attended to. In the first place, agreeably to what was before observed, it will be evident that the equability of density in the mass requires to be carefully secured, and the balancing must be perfected by means of the

adjustable plugs before mentioned, both in the disc and in the gymbal frames; the pivots of the gymbals must be of perfect workmanship, to turn with the least possible friction, yet without looseness or displacement; an immense rotatory velocity must be communicated to the disc by machinery, of which its suspension must be quite independent, so that the moving power can be instantaneously withdrawn. All these conditions are fulfilled in the form of the machine which, after repeated trials, has been adopted by Professor Smyth, exhibited by him at the Paris Exhibition in 1855, and successfully tried by him on board Mr. Stephenson's yacht Titania, on his voyage to Teneriffe in 1856.*

The machine is in fact simply a gyroscope, but of a form peculiarly modified to suit the special purpose for which it is intended.

To explain the principle of its action, we must consider the general conditions of the case.

In the first instance, it may be necessary to bear in mind that a telescope pointed to a star may undergo a motion of translation to any extent, and in any direction, provided it retain strict parallelism to its original position, that is, remain pointed to exactly the same altitude and azimuth, and it will retain the object in its field just as if it were absolutely fixed. This (it is obvious to any one acquainted with astronomy) is simply the result of the absence of parallax in the heavenly bodies within the limits of these observations, and applies even to distant terrestrial objects. Thus, if we imagine a ship going in a perfectly straight course on a perfectly level sea, or even if its motion on the waves were confined to one straight direction up and down, this parallelism might be retained; but this, it need hardly be said, is not the actual case, even if the course be perfectly straight, so that the motion of the telescope, in this respect, is perfectly of a parallel kind, yet still the pitching and rolling take place by angular motions, in planes respectively parallel and perpendicular to the length of the ship. The slightest angular motion is destructive to the parallelism of the telescope. It is against this, therefore, that it is our object to guard.

Now to explain the manner in which this result may be obtained, we have merely to recur to the general mechanical principles already laid down; and from these it will be at once understood that, in the construction of the gyroscope or revolver suspended in gymbals, the grand principle of fixity of the plane of free rotation is that which enables the revolving disc to retain parallelism to its original plane, however the external frame or pivots supporting the whole be moved. From this principle the revolving disc resists all angular change of position in directions perpendicular to its plane, but it offers no resistance to any motion in that plane. Thus, if set spinning horizontally, it will resist all angular motion impressed in a vertical plane, either by the pitching of the ship in the direction of its length, or its rolling in the direction of its breadth; but it will not resist lateral motion in a horizontal plane, such as any shifting of the ship's head towards the points of the compass.

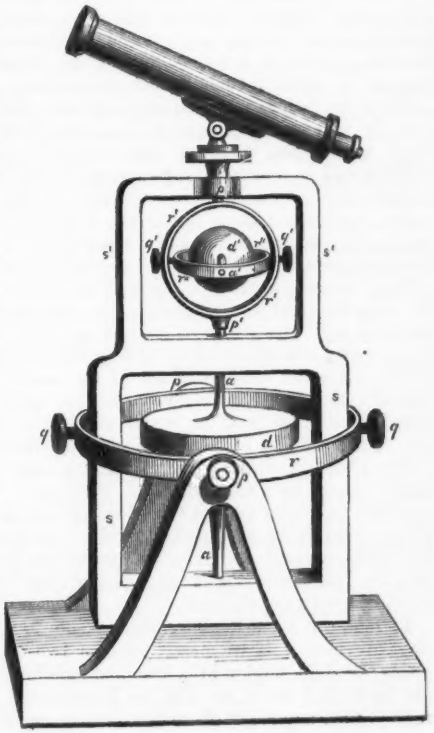
* See a paper "On the Angular Disturbances of Ships, &c." by Prof. C. P. Smyth, F.R.S. Trans. of Royal Scottish Society of Arts, vol. iv. part 4, 1857; also Astron. Society Notices, vol. xvii. p. 36. A full notice of the whole subject will also be found in the American Annual of Scientific Discovery for 1859, by D. A. Wells.

In fact, Professor Smyth's original and simpler construction was nothing more than a single balanced revolver thus mounted.

Thus a free revolving disc in gymbals, externally turning on pivots horizontally resting on supports fixed to the deck, will suffice to preserve the telescope from all deviation due to pitching and rolling; the addition of another disc, freely revolving in a vertical plane, whose external pivots turn vertically in a frame attached to the top of the former internal frame, the upper pivot projecting through it, and carrying a small platform for the telescope, and the whole, of course, balanced below, will preserve the telescope from any lateral deviations of the ship; and the combination of the two will give a plane retaining its parallelism against all three causes of disturbance. But under favourable circumstances this last cause of disturbance is but small; so that this addition may be often of little importance.

The invariable platform of this revolving apparatus may then equally be applied to support either a telescope, or the artificial horizon before mentioned, whether simply or in conjunction with the sextant, or reflecting circle.

To render the construction more intelligible the annexed figure is inserted, in which it will be at once seen how the conditions first mentioned are fulfilled.



The lower part of the stand is fixed firmly to the deck; on the first pair of pivots $p\,p$ the circular rim r swings: this, by the second pivots $q\,q$, carries the frame $s\,s$, in which turns the vertical axis $a\,a$ of the heavy balanced disc d. The upper part of $s\,s$ terminates in a similar but smaller frame $s'\,s'$, in which, in like manner, the ring $r'\,r'$ turns on vertical pivots $p'\,p'$. In this ring, by the second pivots $q'\,q'$, is suspended an inner ring $r''\,r''$, which carries the disc d' by an horizontal axis a'.

The axis $p'\,p'$ goes through the upper part of the frame, and to this is attached the support on which may be fixed either the telescope, as represented, or an artificial horizon.

In such a construction we have supposed the observer to stand or sit on the deck of the ship, himself exposed to the motion from which his telescope is exempt; and in this manner were Professor Smyth's trials of the machine on board the yacht actually made; and, from the large amount of motion to which so small a vessel was liable, it may be concluded that a severe test of the capabilities of the method was afforded. The trial appears, however, to have been perfectly satisfactory; but, doubtless, the use of the telescope under such conditions would require considerable skill and practice on the part of the observer, both of a nautical and of an astronomical kind.

The great difficulty being thus got over, it may, perhaps, be thought better not to embarrass ourselves with mere refinements of construction to meet objects which, though of much convenience and value, are not equally essential.

Yet it is evident that, for nice observations, it would be a great advantage to any observer, however skilled, to possess the means of partaking himself in the stability given to his instrument. It may thus not be without interest to devote a few further remarks to the possibility of securing an object of such evident convenience.

Now it is obvious from the nature of the construction that in theory, at least, by a mere enlargement of the scale of the machine, the same stand which carries the telescope might be made to carry the observer also, which would be a material convenience for any nice observations. But a practical difficulty arises: the essential condition is the preservation of perfect equilibrium about the centre of motion. Now if this were secured by proper compensation for the observer in one position, the slightest change of position on his part would vitiate that arrangement.

The observer, instead of being an extraneous source of disturbance to the supports, and thus incapable of producing any impression on the balanced and revolving system, now becomes a part of it, and thus impresses upon it a fresh motion, arising from every slight change of posture, which alters the exact position of the centre of gravity of the whole. This effect, however, would not manifest itself directly, but, being compounded with the rotation, would show itself in a precessional motion, fatal to the stability of the direction of the telescope.

But even the difficulties thus arising may be shown to be capable of being obviated by a mere extension of the same principles as those already appealed to. And though this form of the construction has not been as yet been practically tried—as indeed, its merely secondary importance has hardly seemed to render necessary—yet Professor Smyth has clearly explained the conditions of the case, and fully described a construction by which the evils are obviated.

In fact, the remark above made points to what would take place in a single revolver. If we merely suppose two such revolvers, having their pivots at right angles in a common exterior frame, but both rotating in the horizontal plane, so that one be corrected for pitching, the other for rolling, then any slight disturbance of the equilibrium of the whole would

be resisted by one of the revolvers, according as it might tend to turn the frame about the line of the exterior or of the interior pivots of the entire frames. The resisting revolver would show the disturbing force compounded with its rotation, and giving a tendency to precessional motion, which, when the speed was great and the disturbance small, would be long before it was completed, and thus, for the time, preserve the stability.

Thus, as Professor Smyth observes, "If any want of balance is produced on the frame, it is not immediately altered thereby, the first effect being only to make the appropriate wheel turn on its gymbal pivots. If, too, the wheel is heavy and the speed great, this precessional turning will be so slow that there will be time for an attendant to press in the opposite direction on the general frame, and correct the effect of the observer's want of balance, before the plane of rotation coincides with the direction of the disturbing force, when the virtue of resistance ceases."

To strengthen the effect, and at the same time to give a more convenient balance to the whole, the two discs respectively are reinforced each by a corresponding revolver at the other end of the same diameter of the frame, and similarly mounted in the inner general frame.

Thus all angular disturbance in vertical planes being got rid of, it only remains, on the principle before described, to add a fifth revolver in the middle, in a vertical plane, to counteract angular horizontal motion. The inner general frame supports a vertical frame, which carries this last revolver. Thus we have the construction of "the compound precessional free revolver stand," as the inventor designates it.

It is hardly necessary to add that, in all forms of the apparatus, the motion is communicated by a separate train of wheels, exactly on the same general principle as before described. But, to complete the whole, Professor Smyth has carefully investigated the best form of a train of wheels for communicating the rotatory motion; and has also considered the question of the best moving power to be used—which he finds, after many trials, to be that of water—which is best brought to bear by a peculiarly beautiful and simple form of the turbine.*

* This is fully described and figured in the paper before referred to.

Wednesday, May 25th, 1859.

Captain PACKE, in the Chair.

The ACCLIMATION of EUROPEAN TROOPS for SERVICE in INDIA, and the ORGANIZATION there most SUITED to SECURE EFFICIENCY in the FIELD.

By James Bird, Esq., M.D. F.R.C.P., and late Physician General Bombay Army.

Among the mountain ranges of the western ghats of India, the Neilgherries, and elevated spurs of the lofty Himalayan chain, districts and climates, suitable for the healthy residence and vigorous existence of the European race, have of late years been eagerly explored, and as rapidly made the settlements of English invalid officials. The best known and most frequented of these hill stations are Aboo and Mahabaleshwar on the west, for the Bombay presidency; Ootakamund and the other Neilgherry stations for Madras; Darjeeling for Calcutta and Bengal; Simla, Nynee Tal, Landour, and Mussoorie, for Bengal and the north-west provinces; and Murree and Dalhousie for the Punjaub. The experience of thirty years has established that the climate of these stations is congenial to the feelings and health of Englishmen, and that, as permanent residences, they are suitable for our population, in so far as their limited extent of territory permits; and that the out-door labours of settlers would not, for eight months of the year at least, be interrupted by the excessive rain-fall, which, for successive days of the four months of the Indian rainy season, is found amounting to 10 or 24 inches of rain daily. Along with the introduction, therefore, of the railway system into India, flattering schemes for the colonization of these hill stations, and the cantonment there of a large English force, have been perseveringly and glowingly set before the Government and the public, as encouragement for both to liberally subscribe their money for the practical completion of such schemes. Some of these recommendations, however, more particularly their military occupation as acclimating stations for troops, have been made without due knowledge and consideration of the physiological changes effected in the human body, under change of climate and locality; or of the hygienic conditions under which such changes, and the acclimation of Europeans, with the results of their efficiency for service in hot climates, can be most effectually obtained. In fact, the elevated table-lands, or plateaux, above which several of the hill stations rise, such as Dapoorie, on the same high plain as Poona, or 1,900 feet above the sea-level, have been somewhat incongruously spoken of as hill stations, and recommended, in the same breath with the last, for extended military occupation. But the conditions of climate peculiar to the former, and the organic physiological changes effected by residence there, which form individual constitutions suitable for hot climates, are altogether different from those experienced at higher elevations of from 4,000 to 7,000 feet; where elevation is accompanied by the same diminution of temperature as met with in temperate latitudes, or in this country, but from which European soldiers, after years

of healthy residence, would, on descending to the lower plains for military service, suffer nearly as much as if under direct and immediate transference from temperate to equatorial latitudes; where, as already recommended in my former lectures, the best means of assimilating the raw soldier's constitution to new employment and climate will be to remove, as far as possible, all local and topographical causes of unhealthiness; and to neutralise, at the same time, the hurtful agencies of extreme and variable temperature, or excessive dryness and humidity, by well-regulated systems of diet, clothing, exercise, and amusement, along with the healthy sites of the soldiers' tents, barracks, huts, and hospitals.

Certain increased ratios of sickness and mortality among masses seem inseparably associated with certain degrees of latitude; the average of human life, under equal circumstances, being shorter in proportion as we are near the equator, and lengthening gradually as we approach the pole. Such higher or lower averages seem mainly dependent, as a whole, on higher or lesser degrees of temperature and moisture connected with particular latitudes, and are inversely as the degrees of latitude. They are also relatively greater or less, in the inverse ratio of elevation of site and locality, when the diet, clothing, and social and moral habits of individuals are alike and placed under equally sanitary conditions of a dry soil, good drainage, and an open country, more exposed to sea than land breezes. The conservative influence of insular maritime climates is greater than continental sites in the same degrees of latitude, and is probably one reason why the per-centage of mortality for age in England is less than that of France. In the southern provinces of the latter country, where the climate is warmer, the average mortality of the population is a tenth greater than in the northern provinces, or 1 in 33 to 1 in 44; and yet it is not from the last, but from the former, that troops for service in Algeria are taken, as their constitutions, after a few years' residence there, are found better able to resist the morbific influences of a hot climate, and the disturbed physiological actions of constitution incident to all cases of transference from different climates and localities. To avoid, therefore, the probability of any great increase of the ratio of sickness and mortality, among troops under transference from cold to hot climates and localities, it is desirable that the transference should be effected at that season of the year when the conditions of climate and country to which troops will be exposed are found to vary least from those conditions characteristic of the climate and locality they have just left. In selecting, then, particular elevated sites and localities for military occupation in hot climates, the question is not one merely of the highest elevation, possessing climatic conditions of the temperate zone, and the consequently diminished chance of engendered malarious influence and sickness; but at what altitudes and in what localities of India, and other hot climates, can large bodies of troops be best cantoned and habituated to varied and elevated temperature; and to the moisture of these climates, so as to keep down high ratios of sickness and mortality among soldiers, and render them most efficient for service in the field. If the question was only one of colonization or permanent occupation, without chances of removal to service and fatigue in a warmer atmosphere, the choice, without any risk of failure or disappointment in result, might be given to the greatly elevated and colder hill climates of

India, met with at the height of between 6,000 to 8,000 feet. But, on the subject of military occupation and the cantonment of troops, it plainly resolves itself into conclusions from facts, as to the final results for armies best prepared for field service; or, in other words, what climates and localities of India are most calculated to effect that sanitary condition of European military masses, so as to render them least susceptible of morbid impressions, during exposure to heat and other causes of disease incident to field-service in that country: where, out of any given number of men, entering on such service, and accustomed to a hot climate, there will be the greatest amount of efficiency in the field, under a decreasing ratio of sickness and mortality. The answer to these queries, and their solution, mainly depends on a right appreciation of what essentially constitutes for strangers in a new climate, and under its modifying climatic agencies, that altered constitutional condition which ends in health for the new comer, with the possibility of living in and resisting the diseases of the country nearly as well as those who are indigenous to it. These modifying atmospheric agencies are temperature, density, moisture, and electricity; the nature and composition of the soil and locality, with its extent of easting, and proportion of continent or otherwise; which, continually acting on the body, effect in due time a special modification and interchange of organic functions, which adapt individuals and masses to the new conditions of their existence.

Some, from having confounded together two orders of agencies, the atmospheric and endemic or miasmatic causes of disease, absolutely deny the possibility of acclimating Europeans in hot climates. Mons. Baudin in France, Sir Alexander Tulloch and Mr. Martin in this country, incline to this view:—which is, however, opposed by the enlarged experience and well-considered opinions of Dr. M. Levy, MM. Celle, Perier, and Aubert Roche in France, and of many other experienced army medical officers in this country. Dr. Levy says, "According to the investigations of Sir Alexander Tulloch, it has been advanced that prolonged sojourn, far from promoting acclimation, increases the chances of mortality; and statistics, always pliant and flexible for every kind of paradox, have crowded their group of figures around this opinion. Soundly-observed facts refute it however. From 1,220 military who died in Algeria, and taken at random, three-fourths had not exceeded a residence of 17 months. We have also noticed the progressively numerical decrease of men discharged: for, out of 1,575 dysenteric cases that came under observation during 10 years in Africa, 338 belong to the first year, 235 the second, 150 the third, 86 the fifth, 35 the seventh, 17 the eighth, and 2 the last two years."*

These preliminary observations on the subject of localizing and acclimating European troops on hill stations in India bring me to the consideration of the three following heads of this lecture:—

1st. If acclimation be possible, what is the nature of that physiological adaptation of European constitutions for hot climates that assimilates them to the same standard of organic action incident to the organism of the indigenous inhabitants, and confers on them a nearly like immunity from certain diseases?

* Traité d'Hygiène Publique et Privée; par Michel Levy, Medicin principal d'Armée, &c. tome i. p. 568.

2nd. The elevation and condition of the stations and climates of India most desirable for placing European soldiers beyond the range of aggravated attacks of fever and bowel complaint, and most suitable for producing that kind of constitutional adaptation by which they may be rendered most efficient for field-service.

3rd. What practical lessons may be drawn from the consideration of these questions, and what organisation of European troops in India would secure most efficiency on service, and with greatest good to the State?

I shall endeavour to treat these points in a comprehensive but brief manner, still sufficient, I hope, to convey to my hearers definite ideas of a difficult subject; obscured as it has been, in some measure, by incongruous elements of morbific causation, such as yearly decrement of constitutional power by age, augmented by miasmatic influences of locality, not having been separated from atmospheric causes by those who obtained statistical figures and results, to prove that in hot climates there is no acclimation. But, if acclimation be possible, what are the proofs of it? I have already quoted the opinion of the well-known French army physician Dr. Levy, that according to his experience the contrary opinion of this is a paradox. Indeed, it is true only in this way, that the law of yearly increasing mortality from five years of age onwards, and which, for Europeans, prevails with the smallest ratio of mortality in temperate latitudes, when exaggerated by transference to equatorial latitudes, and other elements of increased morbid causation, not ameliorated by suitable sanitary arrangements for climate and locality, gives a large and continuously-increasing ratio of physical degradation and mortality. The operation of this law, among masses of men, gives the least statistical ratio per 1000 for the civil population of England, or a mean of 8·45; while in Prussia, France, and other continental states, it increases to 10· and 11·25 respectively. But the relatively mean ratio of mortality under this law, when sought for among the soldiers and officers of the English army at home, is 14·52,* and among those of the French army 15·10;† showing that the soldiers' separation from the influences of his natal place, climate, and association, increases on the whole his physical degeneration—even under home residence and climate. The mean ratios of mortality among the French military at home, and of English troops in Ireland, under this law, compared with the respective means for the troops of both nations under hot climates, are to be seen in Table III. The home ratios, having been calculated for years when the sanitary condition of soldiers was little attended to, are higher than those obtained from later years. What wonder, then, that under transference to equatorial latitudes, and augmented sources of unhealthiness unremoved, and not ameliorated by suitable sanitary provisions and arrangement, statistical figures and results should

* In the tables handed in by Sir Alexander Tulloch, in support of his evidence before the commissioners appointed to inquire into the organisation of the Indian army, the mean of cavalry and infantry is given at 15·52. The other table there, corresponding with No. VI. I have taken from Mr. Marshall.

† The mortality of Europeans under military life, and in increasing ratio according to residence and proximity to the 1st degree of equatorial latitude, is increased by advance of age, transition from native climates, transference to tropical latitudes, unremoved sources of endemic disease, and bad sanitary arrangements for soldiers in respect of their diet, barracks, clothing, and exercises.

have been obtained to speak so loudly against the possibility of constitutional acclimation, or adaptation of the nervous, circulating, and excretory functions necessary to contend against the changed conditions of life in a new climate. We may at once learn, by a reference to Table VII., how this law of yearly-increasing mortality for age, per 1000 of the civil population, operates in this country; and by Table VI. we may see how, by the same law, an exaggerated ratio of mortality takes place among the military on transference to our colonies. In latitudes north of the equator it is least in the Ionian Islands, being 19·8;* but in southern latitudes, under the rather hot climate of the Cape of Good Hope, and where but few sources of miasmata exist, it falls to 17·6, being only 3·8 above the mean ratio for this country.

"Change of climate," says Dr. Levy, "is to be born to a new life. Some changes become necessary in the vicarious or alternate functional action of the principal organs, in the regimen, and habits moral and social; but so complete ought these changes to be that they may be effected without necessarily producing either disease or death. The gift of elasticity of our fibres, the gift of extent of our functional oscillations, is conferred on us for accommodating ourselves to new influences collectively, in order to plant ourselves in every place where humanity is represented by some one of its numerous tribes. But this is under the condition of conforming to things necessary for the transition, and of combating, by attention to hygienic modifiers, the assaults of climate and irregularities of organic action. That the statistical mortality of Europeans in hot climates need not be a subject of exaggerated fears, we repeat that it proves less the radical unhealthiness of certain climates than the deleterious conditions, but correctible, of their topography, such as the existence of marshes, and vast masses of organic matter. It proves above all the baneful consequences of neglecting the laws of hygiene."

The operation of age, in diminishing constitutional vigour, and thereby increasing the yearly ratio of mortality among bodies of men, is sensibly felt and appreciable, under all conditions and in every quarter of the globe. The statistical results, therefore, of this operative law necessarily increase, in proportion as those subject to it are exposed to additional causes of morbid causation in hot climates, and such as have been mentioned; but, though we cannot altogether bring down the mean ratios of mortality of hot climates to the standard average of temperate ones, we have still within our power the removal of certain endemic sources of disease in localities, and to so train the changing organic functions of the body into a healthy state, under altered conditions of elevated temperature, for purposes of assimilating a majority of European constitutions to hot climates, and with results of having mean ratios of sickness and mortality among troops, not greatly in excess of those incident to our own country and like temperate zones. If this were not the case young soldiers in India, under exposure to elevated temperature and fatigue, would be quite as healthy as the old or seasoned ones; while the very reverse of such result is found to be the experienced opinion of old military and medical officers. The acclimation so acquired, and by which old soldiers

* In the second of Sir Alexander Tulloch's tables before quoted this is given at 16·4.

can outwork the younger ones on a campaign, is not mere experience gained by residence; but partially a physiological adaptation of constitution to new conditions of life, with improved physical qualities, for accommodating itself, under fatigue, to those conditions.

The adaptation to the changed conditions of hot climates, independent of miasmatic sources of disease, must be gradual and progressive for unacclimated masses of strangers, and imposes on them the necessity of shorter or longer sojourn in intermediate regions, with proper attention to moderate eating and drinking, selection of season for landing in the new climate most akin to that which they had just left, and, after arrival, fixing on habitations and localities free from miasmata, protected from land winds, and under the salutary influence of those from the sea; together with the resolute adoption of suitable diet, clothing, and exercise. Such care and attention become necessary, in order that certain organic functional actions, in more elevated temperature, may be reduced in force, and so regulated as to be brought into vicarious healthy action in place of others, and to aid some, lessened in power and activity.

At page 31 of the Appendix to Minutes of Evidence taken before the Commissioners appointed to inquire into the Organization of the Indian Army, Returns 34 and 35 are given, in illustration of the comparative beneficial results of transference of regiments to India, after sojourn in the intermediate climates of Australia or the Cape, and of direct transference from England. While the result of these Returns makes questionable the propriety of transferring troops from our Australian colonies, they bring out the benefit of doing so after a sojourn at the Cape. The mortality of five regiments sent from the Cape to India, after the first year of service, was 4·8 to 11·0 among eight regiments sent direct from England; and if the ratio of mortality for three additional regiments at the Cape be added to the former ratio, we obtain the comparative beneficial results of transference from the Cape and from England as 7·21 per cent. to 11 per cent. of their strength. Nothing can be more conclusive than this of the possibility and benefits of graduated acclimation to elevated temperature, apart from the miasmatic influence of locality. The superiority of residence at the Cape over the graduated influence of a sea voyage, is thus brought out. Acclimation too of troops in India, under suitable sanitary arrangements, as not only practicable, but an obvious result among old soldiers, when they have become seasoned, is further substantiated by many valuable facts brought forward in Mr. Willoughby's able and consistent evidence, given at p. 267 of the Commissioners' Report, as well as by much that is admitted in the evidence of the medical witnesses; for at page 171 of the Report, and in reply to Major-General Hancock's question, "Does not a greater mortality prevail among young officers and soldiers than among those who have been eight, ten, or twelve years in India?" Mr. Martin answers, "Yes, always; the mortality is greater among the young, the improvident, and, if I may so call it, the unseasoned. I am afraid to say anything which should lead to the conclusion that there is such a thing as acclimation; but that kind of accommodation of the habit and constitution occurs in every country in the world, not in India alone. The army of Napoleon broke ground from Boulogne in 1805, he marched 400 French leagues to the battle of

Austerlitz, they were all old soldiers, they were exercised, no room was left for idleness, and there were hardly any sick on the roads. When he went again, in 1809, to the battle of Wagram, the roads were lined with youths who perished." Is not this corroborative of the opinion I hold, in common with many celebrated physicians and physiologists, "that there is virtually a physiological adaptation of constitution to new conditions of life, with improved physical qualities?" This, too, is an adaptation which not only prepares them for greater fatigues during a campaign, but exempts them from attacks of many severe diseases incident to marching in hot climates, particularly cholera and sun-stroke. Regarding the exemption from the latter enjoyed by old soldiers, Sir Robert Vivian, in his evidence (p. 137 of the Report), adduces, in support of his opinion that Europeans can be seasoned, the superintending surgeon, Dr. Arnott's, medical experience, "that it was a somewhat remarkable fact of two European regiments engaged in the affair before Kooneh, on the 7th May, 1858, the right wing of H.M. 71st Regt., about 425 strong, had twenty men attacked with sun-stroke, of whom seven died, while the portion of the 3d Bombay Europeans, about 330 strong, had not only no casualty from, but no man attacked by, this disease, though both corps were equally exposed to the same causes of disease, and under circumstances apparently precisely similar. The 3d Europeans had an average service of three years in India, the 71st arrived in Bombay the preceding February, 1858.

Acclimation, then, in hot climates being admitted as a physiological and practical result, I come to the second part of the inquiry, "What should be the elevation and condition of stations and climates in India most suitable for producing that kind of constitutional adaptation, by which men may be made most efficient for field service?" Not certainly in the more elevated mountain climates of India, within the range of 4,000 to 7,000 feet, where diminution of temperature produces climates akin to those of the temperate zone, and associated with kindred organic functional actions of the body as are met with in those; except that calorification and respiration are less energetic from the diminished density and oxygenation of the air, while the processes of sanguification and nutrition are more venous and incomplete, with a greater concentration of blood in both the lungs and digestive apparatus. Their limited extent, too, may scarcely admit of large bodies of soldiers being acclimated there, and it would be found on experience that, like the indigenous inhabitants of these mountain ranges, Europeans so localised, when brought down from the hills for service in the plains, during the rains and hot weather, would be quite as sickly under the transference, and die in as great relative proportions as men brought direct from England. Elevation of site in equatorial latitudes is accompanied by nearly like climatic conditions as are met with in the temperate zone, and with the same preponderance of certain functional actions of the organism as distinguish its inhabitants and vegetable productions. Special modifications and interchange of these functions would be as necessary, under transference to the elevated temperature and other altered climatic conditions of the plain, as when required for improving the health of Europeans, recently arrived in India.

On this subject Sir George Clerk, in his evidence, page 195 of the Commissioners' Report, says, that locating European troops on the

mountains of India is a false measure; and that with good barracks placed at certain commanding points on the plains of India, they would be more healthy than they are in the West Indies, or in many other colonies. If by commanding points he means, such dry sandy plains as Deesa, or the high plateaus of Poonah, Belgaum, Dharwar, Bangalore, and such like elevated places in the Bombay and Madras presidencies, I entirely concur with this opinion, that with good barracks, and under suitable sanitary arrangements for diet, clothing, and exercise, the ratios of mortality per 1,000 would be so reduced as not to exceed those of temperate climates. In all of these places, much of their healthy character is evidently due to the dryness of the site. At Deesa, in the northern military division of the Bombay presidency, where the elevated temperature sometimes exceeds 110° of Fahrenheit, the ratio of mortality, for 10 years, 1847-57, was 21·9 per 1,000; at Poona, 10·7; at Belgaum, in the southern division, 19·; at Bombay, 55·5; and at Bangalore, in the Madras Southern division, 23·8. At Aden, in Arabia, a very dry locality, but hot climate, the ratio per 1,000 is only 25·2. Soldiers cantoned at elevated sites, ranging from 2,000 to 2,500 feet, would be more efficient in the field, and more able to bear up against hardships and exposure on actual service, than those stationed at higher elevations and under conditions of climate more nearly akin to those existing in the temperate zone.

Stations of this kind, where large bodies of troops may be cantoned and acclimatised for Indian service, are everywhere available through the wide extent of the Bombay and Madras presidencies. Selection of moderately elevated sites for Bengal proper, that may be rendered healthy for troops, by means of good drainage and well-constructed barracks, is a matter of more difficulty, from the general flatness of the country: but for the north-west provinces, many eligible and elevated sites may be chosen for locating European troops. Dryness of site, gravelly character of soil, and freedom from masses of organic matter, should be always of the greatest importance in determining a preference of selection for such stations.

Mere elevation of site, without other essential conditions of endemic health, will not necessarily secure low ratios of mortality for troops. Reference to Tables IV. and V. for the ratios of mortality according to elevation of site in the tropical latitudes of the east and west, indicates that at elevations much higher than that of Poona, and other like healthy localities, where, from the nature of the soil and site, endemic sources of malarious disease are allowed to exist, the ratios of mortality per 1,000 will be still found very great, and little or at all below those attainable for troops localised on the plains—facts sufficiently instructive in guiding us to the most necessary sanitary arrangement for soldiers in hot climates, namely, to select, for their barracks or encampment, eligible sites and localities, where there is no accumulation of surface-drainage, and no relative sources of miasmata in the vicinity.

In the Madras presidency, the average ratios of mortality for five years will be found least in the presidency and Mysore divisions of the army, including Bangalore, being respectively 25·5 and 23·5. Within the ten military divisions of that presidency, though there are some very elevated sites, still they are most unhealthy from those endemic sources of disease we have mentioned, and there are many others that

might be yet selected with great advantage for the localisation of troops. Among the elevated but unhealthy sites within this presidency, it will be instructive, on this subject, to notice that in the Mysore division the sites of Seevasamoodrum and Seringapatam, elevated about 2,000 feet, have been found very destructive of European health, while many other localities of the same division, peculiarly productive of fever in former times, have since become perfectly healthy; and in others the very reverse has taken place, shewing the main sources of European unhealthiness are endemic miasmata, and not mere elevated temperature, to which the human organisation adapts itself. Seevasamoodrum is surrounded by water and jungle, and near one of the falls of the Cavary. In other districts of this presidency the ravages of fever and other miasmatic diseases are not stayed, even at an elevation of nearly 5,000 feet, where their endemic sources are allowed to exist. In the Travancore province of the southern division a considerable plateau of table-land, 4,740 feet high, and in the vicinity of Trevandrum, but not yet thoroughly explored, is said to be healthy. Again, in the Salem district of the same division, the table-land of the Shivaroy hills, at a general elevation of 4,600, and but scantily clothed with vegetation, is not beyond fever range after falls of rain. During the dry months they have been found perfectly healthy; but the breaking out of a fatal remittent form of fever among the European residents there, during June, 1824, caused them to be deserted. It is not mere elevation then that we have to look to for European health in India, but to an eligible and perfectly well drained and dry site for European soldiers.

I come now to the third and last point—What practical lessons may be drawn from the consideration of these questions, and what organisation of troops would secure most efficiency on service, and with greatest good to the State? The previous observations made, and the statistical facts adduced in proof, that old and seasoned soldiers are superior in endurance and physical qualities to young unseasoned ones in India, have partly anticipated the solution of these problems. Lord Ellenborough in his evidence, p. 293 of the Commissioners' Report, fully bears out this opinion in the statement that he saw 100 men of the 9th Lancers, who had never seen an enemy, die within the first year of their residence in India. At the utmost strength of cavalry regiments this would be fully a sixth of their strength. The possibility of acclimating troops to mere elevated temperature being possible, and the adaptation of their constitutions being followed on service by lessened ratios of sickness and mortality, form one of the strongest grounds for a considerable organisation of European troops for local service in India; independent of those financial and political considerations, which, for the ultimate safety of our Indian empire, strongly urge on us the necessity of this measure. It is not within the province of this lecture to discuss the financial and political bearings of the question, that there should be a large permanent European force maintained in India, and proportioned to the moveable force of the British Army, always subject to the periodical reliefs from home. The permanent force should be at least two-fifths of the moveable force—say 32,000 to 48,000 men of the regular Army, from among whom, on being relieved to return home, European colonists for hill stations, and recruits for the permanent local force, might be obtained.

In concluding the exposition of the medical questions that have been mooted, we may draw the following inference:—

1st. That the law of constitutional deterioration—greater mortality for age in hot climates, beyond the ratios of like age in temperate ones—can be greatly reduced in operation by removing endemic sources of disease, and by selecting suitable dry localities.

2nd. That in the most insalubrious tropical countries, the selection of good positions, on dry elevated table-lands, suffices often to secure for European troops a perfect sanitary state, nearly equal to the more salubrious regions of the temperate zone: this salubrity varying, however, in a remarkable manner with the geographical latitudes and longitudes of places.

3rd. That the increasing ratios of mortality for hot countries mainly depend on unremoved surface drainage, and the generation of miasmata in places occupied.

4th. That the morbific influence of seasons and climates in producing disease is in direct relation to and dependence on the quality of the soil, the latitude, the longitude, the elevation of the place, its northern or southern exposure, and the national temperaments and races of soldiers who may be there located.

TABLE I.—GENERAL MORTALITY of the ENGLISH ARMY at HOME and ABROAD, from 1819 to 1828.

Years.	Effective Strength in the United Kingdom.	Deaths.	Ratio of Deaths per 1,000.	Effective Strength beyond the United Kingdom.	Deaths.	Ratio of Deaths per 1,000.
1819	53,380	493	9	54,992	3,755	63
1820	54,527	740	11	50,557	2,584	57
1821	37,988	620	16	51,277	2,220	42
1822	41,530	560	13	46,709	2,692	57
1823	40,786	566	13	48,995	1,981	40
1824	42,585	651	15	49,888	2,257	45
1825	57,048	854	16	53,755	3,849	71
1826	48,826	1,082	22	58,339	4,513	77
1827	47,747	824	17	58,440	3,713	63
1828	46,193	828	18	58,592	2,844	47
Total . .	470,610			531,534		

TABLE II.—MORTALITY of ENGLISH TROOPS from WAR, and under TRANSITION to OTHER COLONIES.

Places.	Authorities.	Period of Observation.	Annual Mortality per 1,000.
Cape of Good Hope	Official Reports, 1818 to 1836	1818 to 1836	15·5
New Scotia and New Brunswick	Ditto	1817 to 1836	18·
Malta	Ditto	1817 to 1836	18·7
Canada	Ditto	1817 to 1836	20·
Gibraltar	Ditto	1818 to 1836	22·1
Ionian Islands	Ditto	1817 to 1836	28·3
Mauritius	Ditto	1818 to 1836	30·5
Bermudas	Ditto	1817 to 1836	32·3
St. Helena, 1816 to 1822, and from 1836 to 1837	Ditto	.. ..	35·
Tenasserim Provinces	Ditto	1827 to 1836	50·
Madras Presidency	Quetelet	1826 to 1830	52·
Bombay ditto	Ditto	1826 to 1830	55·
Bengal ditto	Ditto	1826 to 1830	63·
Ceylon	Official Reports	1824 to 1836	57·2
Antilles and Guiana.	Ditto	1817 to 1836	85·
Jamaica	Ditto	1817 to 1836	143·
Bahama	Ditto	1817 to 1836	200·
Sierra Leone	Ditto	1819 to 1836	483·

TABLE III.—COMPARISON of the MAXIMA and MINIMA of MORTALITY of FRENCH and ENGLISH TROOPS in TEMPERATE and HOT CLIMATES.

TEMPERATE CLIMATES.				HOT CLIMATES.			
Periods and Departments of Service.	Mortality per 1,000.			Periods and Departments of Service.	Mortality per 1,000.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
FRENCH. Infantry for 6 years in France, 1820 to 1826	23	15	19·4	FRENCH. In Algeria 5 years, 1838 to 1843	104·	49·	76·5
ENGLISH. Troops in Ireland 32 years, 1797 to 1828	20	10	15·	ENGLISH. In the Antilles and Guiana 19 years, 1817 to 1836	152·8	40·6	96·7

TABLE IV.—INFLUENCE of ELEVATION and LATITUDE in DIMINISHING the RATIO of MORTALITY among EUROPEANS in HOT CLIMATES.

Countries and Latitudes.	Stations.	Elevation in feet from the Sea.	Mortality per 1,000.	Remarks.
Saint Lucia, 13° 50′ north	Mount Fortunate	850	122·	
Jamaica, 17° to 18° 30′	Up Park Camp	200	152·8	
	Stony Hill	1,360	96·	
	Maroon Town	2,000	32·	Deducting deaths of sick
Ceylon, 6° only of north lat.	Kandy	1,670	60·7	brought there, only 22
	Badula	2,100	97·1	
	Nieur-Elia	6,200	24·	
Mysore	Bangalore	2,400	22·	In 1849 only 16 per
Neilgherry Hills, in lat. north 11° 10′ to 11° 32′	Ootakamund	7,116	20·	1,000·

TABLE V.—INFLUENCE of PROLONGED SOJOURN in INCREASING the MORTALITY of HOT CLIMATES.

Places.	Length of Sojourn.	Periods of Age.	Mortality per 1,000.	
Ceylon . . .	Below 1 year	—	44·	
	1 to 2 years	—	48·7	
	Beyond 2 years	—	49·2	
Jamaica . . .	Below 1 year	—	77·	
	1 to 2 years	—	87·	
	Below 2 years	—	81·	
	Beyond 2 years	—	93·	
Cape of Good Hope .	3 years	—	8·	The mortality here given is only of one Regiment, the 72nd, of which the effective strength is unknown; but still progressively increasing in a country where malarious influences on mortality is scarcely appreciable.
	4 ditto	—	13·	
	5 ditto	—	12·	
	6 ditto	—	16·	
	7 ditto	—	13·	

TABLE VI.: from Mr. MARSHALL.—INFLUENCE of AGE on the ANNUAL MORTALITY of every 1,000 EFFECTIVE MEN among ENGLISH TROOPS at HOME and ABROAD.

Places of Residence.	Mortality per 1,000 from Age.				Mean Mortality per 1,000 at all Ages.
	From 18 to 25 Years.	From 25 to 33 Years.	From 33 to 40 Years.	From 40 to 50 Years.	
United Kingdom { Cavalry of the Line	13·9	14·	17·8	26·7	15·3
United Kingdom { Horse Guards	14·7	11·4	16·3	22·8	14·5
United Kingdom { Foot Guards	22·3	22·5	17·7	27·5	21·6
Gibraltar	18·7	28·6	29·5	34·4	22·3
Malta	13·	23·3	34·	56·7	22·3
Ionian Islands	12·2	20·1	24·4	24·2	19·8
Antilles	50·	74·	97·	123·	67·
Jamaica	70·	107·	131·	128·	91·
Bermudas	16·5	42·	42·	76·	28·9
Canada—Upper and Lower	19·7	27·7	37·7	35·7	25·7
New Scotia and New Brunswick	14·	22·5	30·8	41·5	20·3
Cape of Good Hope	9·	20·6	29·7	82·	17·6
Mauritius	20·6	38·	52·7	86·7	34·7
Ceylon	34·	55·	86·4	126·6	48·3
Bombay	18·2	34·6	46·8	71·1	33·1
Madras	26·	59·3	70·7	86·5	52·2
Bengal	23·8	50·3	50·6	83·3	44·5

TABLE VII.—MEAN ANNUAL PROPORTION of MORTALITY among every 1,000 LIVING INDIVIDUALS of the ENGLISH CIVIL POPULATION above 4 YEARS of AGE, 1838 to 1841.

Age.	Ratio of Mortality per 1,000 Living Males of every Age.	Age.	Ratio of Mortality per 1,000 Living Males of every Age.
Under 5 years	70·97	From 60 to 70 years	43·60
From 5 to 10 „	9·48	„ 70 „ 80 „	91·98
„ 13 „ 15 „	5·24	„ 80 „ 90 „	201·73
„ 15 „ 20 „	7·30	„ 90 „ 100 „	461·93
„ 20 „ 30 „	9·91	„ 100 and above	454·79
„ 30 „ 40 „	11·30		
„ 40 „ 50 „	15·00		
„ 50 „ 60 „	23·01	General Mean	23·16

Evening Meeting.

Monday, April 18th.

Captain E. G. FISHBOURNE, R.N., C.B. in the Chair.

The Chairman announced that sixteen Members had joined the Institution since 21st March.

LIFE MEMBERS.

Rhodes, Godfrey, Major unatt.
Shadwell, L., A.Q.M.-Gen.
Gore, Jas. A., Major 71st High. L. Inf.

ANNUAL SUBSCRIBERS.

Deane, E. P. Esq., Hon. Corps Gent.-at-Arms
Strahan, Wm., Lieut. R.A.
Reynolds, J. W., Lt.-Col. Dep. A. Adjt.-Gen.
Swan, P., Capt. 3rd R. Middlesex Mil.
Muttlebury, G. A., Lieut. 4th Drag. Gds.
Travers, F. S., Capt. 60th Rifles
Stanhope, W. S. Capt. 1st W. York Yeo. Cav.
Maxse, F. A., Captain R.N.
Hay, T. H. V. D., Ens. Cape M. Rifles
Dowman, Jno. Capt. of Invalids, Royal Hospital, Chelsea
Wray, H., Capt. R.E.
Percival, E. A., Capt. late 11th Huss.
Parker, C. W., Capt. 4th Roy. Midx. Mil.

NAMES of MEMBERS who have paid increased SUBSCRIPTIONS since 21st March.

Boustead, J., late Paym. Ceylon Rifles
Burdett, C. S., Lt.-Col. Coldstream Gds.
Yonge, G. N. K., Major Depôt Batt.
Walker, W., Capt. late 69th Regt.
Bailey, L. C., Master R.N.
Wilson, S. F., Capt. 55th Regt.
Norton, Jno., Capt. late 34th Regt.
Reynolds, J. W., Lt.-Col. D. A. A.-Gen.
Burgess, G. F., Com. R.N.
Griffiths, Julius G., Lieut.-Gen.
Stanhope, W. S., Capt. 1st W. Y. Yeo. Cav.
Read, C. H., Lieut. late Ceylon Rifles

DONATIONS.

	£	s.		£	s.
Rhodes, Godfrey, Maj. unatt. . .	3	0	Skey, Dr.	1	0
Burrell, Justinian, Capt. R.N. . .	0	10			

PRESENTS.

LIBRARY.

Books.

Military Transport by Sea. Pamph. 8vo. London, 1859.
Presented by C. Alexander Wood, Esq.

Blue Books:—Report of the Progress of the Ordnance Survey and Topographical Depôt to 31st December, 1858.

Report of the Commissioners appointed to inquire into the best means of Manning the Navy; together with the Minutes of Evidence and Appendix. London, 1859.
Presented by Lieut.-Col. J. F. D. C. Stuart, Gr. Gds. M.P.

W. J. Trery, Esq.—A Study Book of Civil and Mechanical Engineering. No. IV. Folio. London.
Presented by Mr. Jobbins.

Sir John F. Davis, Bart. F.R.G.S.—China during the War and since the Peace. 2 vols. 8vo. London, 1852.
Poetry and Criticism. 1 vol. 8vo. 1850.
Hien Wun Shoo. Chinese Moral Maxims; with a free and verbal Translation.
Chinese Novels. Translated from the Originals, &c. London. 8vo. 1822.
Presented by the Author.

National Life Boat Institution, Journal of. Vol. IV. No. 32.
Presented by the Institution.
Royal Artillery Institution.—Occasional Papers. No. 10. March, 1859.
Presented by the Institution.
Royal Society.—Philosophical Transactions. Part III. Vol. CXLVII. for 1857. Part I. Vol. CXLVIII. for 1858. List of Fellows, 1858. *Presented by the Society.*
Views of British Military and Naval Burial Grounds in the East. 1 vol.
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Nine Bullets ploughed up in Naseby Field. *Presented by G. Ashby Ashby, Esq.*

Military.

10 specimens of Powder Cases; 9 specimens of Pig Iron used in casting Ordnance at the Royal Arsenal, Woolwich; 1 Head of Sponge for 32-pounder; 1 Block of Wood for ditto; 1 Fleecy Hosiery Coating for ditto; 1 Bolt Tire with Nut, 6-pounder gun; 1 Spoke (oak); Portion of Wheel, 9-pounder gun. *Presented by Secretary of State for War.*
Staff-Sergeant's Chaco worn in Infantry Regiments from 1805-7.
Presented by Mr. H. White.

THE SCREW FLEETS OF ENGLAND AND FRANCE.

By C. L. Pickering, Esq.

During the course of last summer, the two greatest naval powers of the day had each a squadron composed of ships of corresponding classes, anchored at the same time within the artificial roadstead of Cherbourg.

Questioning, as I ever shall, the policy of allowing the ships of both nations to mingle together in peace-time, and to act in concert as much as they have of late years, as in Vourla Bay, at Naples, Constantinople, or Cherbourg, an opportunity has at all events been afforded at those meetings, to the officers of both fleets, of comparing the qualities of the respective ships.

If any one thing could have struck an observer more than another, it must have been the marked contrast between the ships of England and France at the first and last of these meetings, comprising a period of barely twenty years. It seems but the other day since the "Royal Albert," "Curaçoa," and "Euryalus," on the one side, and the matchless "Renown," formidable "Diadem," and "Raccoon," on the other, encircled that *chef-d'œuvre* of nautical elegance, simplicity, and good taste, the Queen's Yacht, the whole forming a picture on which many a British officer gazed with delight; and crowds of wondering foreigners who but a short time

back had fully expected to see our ships make a bad show, and had been but too ready to take for granted the unjust comments of our press, now stood staring with awe and admiration. As the gratified seaman scanned the straight sheer, trim set, and faultless rig of the English ships, he could not help recalling that such had not always been the case, and that the comparison, in some particulars at least, had invariably been against us. How different, for instance, was the appearance, ship for ship, of the fleet under Admiral Stopford, with that under Admiral Lalande, at a time too when the rival fleets looked not very lovingly on each other, when the towering "Montebello" lay near our own three-decker "Princess Charlotte," which in herself scarcely averaged the size and broadside weight of the fine French two-deckers of 100 guns, against which class we find even Sir Charles Napier, who then commanded the "Powerful," lamenting, in a letter to Lord Minto, that we could only match undermanned ships of 80 guns, as the "Thunderer," and his own, and the wretched, unsightly 72's, such as the "Benbow," "Revenge," and "Bellerophon."*

The fact is, that these few years have accomplished a wondrous development in naval architecture. The advent of Sir W. Symonds to the surveyorship of the navy began the change, and the introduction of the screw completed it. Under Sir W. Symonds were exploded all the theories and traditions of the old school of shipbuilding; the captured line-of-battle ships and frigates, from French and Spaniards, which had slavishly served for our models, were supplanted by designs of his own; while the lumbering old craft that had carried their guns nearly flush with the water's edge, in which our forefathers fought against such odds with Frenchmen, Spaniards, Dutch, and Danes, from the time of the Tudors till our own, were discarded for ever. Sir W. Symonds clearly proved, by the noble ships which he built, and the emulation his example excited in the profession, that, when unrestricted as to tonnage, the bane of his predecessors from the time of Mr. Petts and Sir Anthony Deane, England could produce naval architects second to none.

I shall not enter into the much-disputed question engendered by the particular merits or demerits of Sir W. Symonds's ships, than which, Sir James Graham once observed in the House of Commons, "he knew no subject except religion that had excited so much bitter controversy." I am quite aware that they had defects, which, in the eyes of the better judges, in some degree nullified their good qualities, and possibly militated against their fitness for action.

Still it remains an established fact, that, despite the opposition from the more regular trained ship-builder, a profession in which every naval officer will not fail to detect more jealousies and heartburnings than in almost any other, civil or military, he was a great and natural genius, and a benefactor to the British navy; for never before his time had English ships been noted for beauty of form above water, capacity of fighting-deck, swiftness of sailing, and stiffness.

The magnificent "Queen," for instance, the most perfect embodiment of his theory, which once went to Malta in ten days, and which, from the time of her launching to the introduction of the screw, was scarcely if ever

* Sir Charles Napier, Letter to Lord Minto, Dec. 4, 1839, p. 126. Past and Present of the Navy.

out of commission, had a long and successful run, and was declared, by no less a judge than the present Surveyor of the Navy, at the time he commanded her, to be perfect on all points.

Sir Charles Napier, whose earnestness in everything connected with the navy is above all praise, and who had been for years the most consistent and persevering opponent of Sir W. Symonds, ultimately bore the same testimony to her good qualities, and expressed a hope in one of his letters that our future three-deckers might be built on her model; a hope which may be said to be carried out to the letter, for our present "Duke of Wellington," "Royal Sovereign," and "Marlborough," are no other than lengthened "Queens."* The noble "Vanguard," the parent of our present two-decked ships, which in 1840, during the motley combinations of fleets in the Archipelago, was conspicuous for her neatness, order, beauty, and swiftness, was another case in point. The Prince de Joinville, an excellent judge, bears testimony in his writings to this splendid ship, and on the occasion of her heading the Turkish fleet, commanded by that subsequent arch-traitor the "Capitan-Pasha," through the Pass of Tenedos, acknowledges that when she passed the French fleet, as if to display, as he himself asserts, her superiority, she elicited the admiration of all the French officers; he adds in the original, "Nos yeux jaloux n'y pouvaient trouver rien à critiquer, il justifiait tout ce qu'il est possible d'attendre d'un peuple marin par excellence,"†—a testimony which, it is not too much to assert, no British ship before her ever elicited from a foreign naval officer. The same might fairly be said of the host of beautiful vessels, whose stiffness in carrying sail, and power of going to windward, are forgotten and despised, and which, nevertheless, by being slightly altered and elongated to meet the requirements of the screw, prepared the way for our "Duke of Wellington," "Agamemnon," "Impérieuse," and "Highflyer," and were further improved for steamers, as experience suggested, and time rendered necessary, into our "Marlboroughs," "Renowns," "Emeralds," and "Pearls."

From these considerations I shall at once enter into my subject, by the enumeration of classes and rates in both fleets. Singling out the most powerful ships, we come at once to the LINE-OF-BATTLE SHIPS, those which, along with heavy frigates, are the more immediate representatives and exponents of the naval power of a nation—the *vaisseau de ligne*, or, simply, *vaisseau de guerre*, of the French; for the term *vaisseau* is never applied in France to anything less than a ship of the line. They comprehend, as of old, such as, from their superior size and armament, are considered of sufficient force to compose the line of battle—to take part in a general engagement—the individual force of each being determined by a regulation from the Board of Admiralty signifying the number of guns mounted, and which has varied greatly throughout all classes since the introduction of the screw. Whilst the like discrepancy may be observed in the French service, the old rates being retained officially, the number of guns in peace time is made subservient to the nature of the service, it being current in the French fleet that even bow and

* Letter to the Right Hon. Lord John Russell, p. 185. Past and Future of the Navy. Sir Charles Napier.

† Essais sur la Marine Française, par le Prince de Joinville. Paris, 1852.

quarter guns would be immediately added in case of collision with a first-class naval power.

Of first-rate line-of-battle ships there are in the British screw navy three classes of armament: as the "Marlborough," "Royal Sovereign," of 131 guns each; the "Victoria," "Royal Albert," of 121; and a third anomalous class, comprising but two ships, the "Windsor Castle" and "Royal George," of 101 guns each; the French numbering two classes, in the "Bretagne," of 140 guns, and the "Louis XIV." of 120.

At the head of all these afloat, and until the "Howe" and "Victoria" are launched, stands the "Marlborough," the finest, as she is also the largest, man-of-war as yet constructed in this country, and an improvement on the "Duke," which she has exceeded in speed by nearly three knots. Of stupendous size and noble proportions, she may be instanced as an example of the system of conversion carried out fully for efficiency, having originally, like all the others above, been laid down for a sailing-ship of the "Queen's" class of 3,099 tons, but in her case altered, whilst on the stocks, by being sawn asunder amidship, and there lengthened 23 feet, the distance of two ports, 7 feet 6 inches abaft in the run, and further more than the "Duke" 6 feet forward in the bow, making her length outside all 286 feet. She is somewhat higher between all her decks than the "Duke," and of little more power in her engines; but in other respects she is the same as that ship.

It must be a matter of regret that circumstances prevented her escorting the Queen to Cherbourg, where, along with the "Renown," she would have contrasted favourably with the "Bretagne," instead of the "Royal Albert," a ship very much shorter, and which provoked very unjust comparisons from both French and English. As a specimen of the sort of information that obtained currency among us, and went the round of the newspapers, it may be stated that a writer, who very appropriately signed himself a "*Land Lubber*," in a letter to the "*Times*," actually mistaking the French mode of admeasurement of *pont sur pont* for the length outside all, as with us, makes the "Albert" longer by 2 feet, whereas it struck every person, naval or otherwise, that as the ships lay near each other within the breakwater, the "Bretagne," with her enormous number of ports, appeared considerably larger. The fact is, that she is even larger than the "Marlborough," as may be seen by the drafts of both ships. The displacement at the constructor's deep immersion, turning French admeasurement and casting tonnage into English form, which I have done, is greater by 630 tons over the "Marlborough," and by as many as 1,158 tons over the "Royal Albert."

The difference in the length is also great, the "Bretagne" being outside all 92 mêtres, or 300 English feet, exactly the length of the "Victoria," and consequently 14 feet more than the "Marlborough," though of less beam by 3 feet. This last circumstance, and the enormous weight of her engines, very nearly 1,000 tons, being the cause of her deep immersion—a fatal and inexcusable mistake in her designer, for it is difficult to believe that even the Minister of Marine, at that time a landsman, could have entertained the project of a three-decker carrying her guns no more than 4 feet 6 inches from the water's edge, as the "Bretagne" does, though otherwise stiff, as she may prove for carrying sail—an error of judgment

in her designer which might so far militate against her in any protracted service when her coal would fail her, or in a sea-way, when she would be obliged to close her lower-deck ports, so as to make her no more than a match for the class immediately below hers, such as the "Renown." It must be well understood at all times that the height of a lower-deck port out of the water is one great criterion by which to judge of the excellence of a ship of the line.

In blowing weather across the Bay of Biscay, on their way to Cherbourg, the "Napoléon," and, indeed, all the other ships of the squadron, kept their ports open and guns run out, whilst the "Bretagne" could only show two or three of her aftermost lower-deck ports open. All our new ships built for screws carry their portsills, on an average, some 8½ feet above the water. It is worthy of remark, that, whilst an error of calculation is apparent in the "Bretagne," the opposite mistake of not giving enough displacement was committed at the same port, and almost by the same men, in the instance of the three-decker "Valmy," launched, in 1847, at Brest, which was to possess unheard-of qualities for a ship of her class, but which turned out so remarkably top-heavy or crank, on her first trial in the roadstead, that the naval authorities of that dockyard foretold she would never stand under canvas at sea, a condemnation which made it necessary to give her a doubling, or girdling of solid timber, from her lower-deck ports to some few feet below her water-line, an expensive, but at the same time the only, remedy for this blunder, and which will not improve her efficiency as a screw-ship. And yet, while such blunders were being enacted in the French dockyards, a London paper, in noticing that the design of the "Bretagne" had been accepted without any modification by the Minister of Marine, further inserted this paragraph: "It would be thought marvellous if our Admiralty showed the same readiness in accepting the many valuable suggestions made to them!" An opinion which may be endorsed, though not in the sense the writer expected, for they know him little, who think the Surveyor capable of entertaining the scheme of a three-decker carrying her guns no higher than they did in the time of Sir W. Raleigh. The error is the more unaccountable, as the French have till now been generally successful with all their three-deckers. In the Revolutionary war the good qualities of the famous "Commerce de Marseilles," taken at Toulon, were very conspicuous, and few of the frigates could sail with her. Sir W. Symonds always regretted that she was prematurely broken up, and he is said to have embodied her good parts in the "Queen."

But to return to the "Bretagne:" her engine-room and stoke-hole occupy a length of 97 feet of her hold, 30 mêtres, incapacitating her for carrying as much coal as the "Marlborough" by 200 tons, three days' full steaming. Everything having been sacrificed to a temporary full speed, a quality insisted on in France almost at the expense of every other, she has reached 12 knots at full power in smooth water, and is supposed to stow coal enough for 6 days' steaming at that rate, or expansively 14 days at 8 knots. I have been told by her chief engineer, and a careful look at her scantling fully justifies the belief, that she strained considerably in her after part, at that excessive speed, on some portion of her passage from Toulon to Brest in July last, so much so as to maké it doubtful whether she could continue it long.

At 11¾ knots, however, she betrayed no signs of weakness, so that her speed for a continuance—and taking the mean average of 11 to 11½ as the results of the different trials with the other fast ships of the squadron, with all their stores and guns on board—her speed will not, I am convinced, be found superior, even if equal, to that of the "Marlborough," which, when properly trimmed under the like condition of sea-service, has reached 10½ and even 11 knots; a result altogether below the expectations of the projector of the "Bretagne," who had reckoned on 13 and even 14 knots after the experiments carried on in the "Pomone," "Phlégéton," and "Napoléon," and which unfavourable results he, of course, charitably attributes to her very defective engines, but which I think may fairly be put to the account of the ship as well. And when I come to add that those engines, manufactured at the national establishment at Indrêt, nominally of 1,200, work only to 2,000, not twice the nominal power, and cost 20 per cent. more in France than if made in England, whilst Maudslay's engines in the "Marlborough," of 800, have worked up to 2,683, very nearly three times the nominal power, and occupy less room by 9,996 cubic feet of space, with just half the number of furnace fires, 24 instead of 48; that the "Bretagne" is no conversion, her designer having had the advantage of laying her down as a screw-ship, and that she was built in the unprecedented short period of two years,—it must be apparent to the most casual observer that, for all practical purposes, the "Marlborough" is the finer man-of-war of the two, and that Sir H. Douglas's suspicions about the general inferiority of the French engines is even now fully borne out.*

In making a comparison between the steam speed of the two ships, I am quite aware that only general conclusions can be drawn from the loose experiments that have been performed in each, but as we are not likely, in peace time at least, to have closer data to go by, I think they will be found sufficiently correct.

The appearance of the "Bretagne" outside, with the exception of her very beautiful figure-head, is not favourable; she is a box of guns, all ports, and has a considerable amount of sheer; her ports, twenty-four in number, on the middle deck, are narrower than our own, and lie very close to one another, being not more than 7 feet 6 inches apart, whilst the "Victoria" has hers as much as 11 feet apart; a very important consideration, and which is strictly observed in all the new ships designed for screws by Sir B. Walker. These dimensions are the results of actual measurement.

In the event of engaging on one side, as at anchor for instance, against a fort, the "Bretagne" will be able to bring to bear the fire of eighty of her guns, whilst the whole number of her ports, including the

* Naval Warfare with Steam. Sir H. Douglas. Introduction, Implied Construction, page x.

This very important consideration, first made known by me in England at this Lecture, has since been endorsed in a very striking manner by no less an authority than Admiral Paris, one of the most scientific and accomplished officers in the French service; for, in his admirable work lately published, I find him lamenting the general inferiority of the boilers put on board French men-of-war, precluding a steam-power in excess of what I have stated. It may be stated, also, that three French officers of rank are in England at the present moment studying this very question.—C. L. P.

bow and stern chasers, amounts to one hundred and eighty. Her bow is good, exactly like that of the "Royal Albert," that is, the foremost port on the middle deck is almost at right angles with the knee, a principle observed in the "Queen" and the other three-deckers commenced by Sir W. Symonds, but which has been departed from in the "Marlborough," "Duke," and "Royal Sovereign," where they come more on the bow, and in the wake of each other, and where the principal reliance for chasing seems centred in the forecastle 95 cwt. gun. Her stern, like that of all screw ships, is more upright than was formerly the case in vessels of her class, and, whilst this disposition is favourable to strength, it has the two marked disadvantages of not protecting the head of the rudder, and of making the shipping and unshipping of it a matter of greater difficulty than heretofore. No quarter piece being added, and the ports and painted streak being continued right round, the French sterns assume a very heavy and ugly appearance; an impression which is not compensated by the caryatides, and other sculptured devices, miscalled ornaments, seemingly out of place in ships of the present day. The value, in a fighting sense, is however not lost, for the "Bretagne," when seen right astern, can fire, when hard pressed, no less than eighteen guns on the plane of her keel right aft,—as many as in the full broadside of a corvette.

With us, setting apart the exception and further improvement of rounding the quarter piece, and continuing the gallery and rails right round, the beautiful elliptical sterns of all our ships of war are exactly what they were when designed by Sir W. Symonds, models of elegance, lightness, and efficiency.

There is a great deal of bright work about the upper deck of the "Bretagne," though not so much as is generally the case in French ships; large brass awnings, or hood stanchions, cover the companion or after hatchway on the quarterdeck; her boats are placed a-head of the funnel, a disposition general throughout the French fleet. Her decks are slightly lower than those of the "Marlborough," and the employment of the old-fashioned knees of wood, instead of iron, adds much to the clumsy appearance of her 'tween decks. If the absence of mess-tables on the lower-deck detracts from the look of comfort, the gun gear and great number of small arms, pistols, muskets, tomahawks, grape, case, fighting lanthorns, which encircle every port, add much to the martial appearance. In the "orlop" is that never-failing eyesore to be found in all French ships, the baker's oven.

There is little to notice in the armament of each ship, unless it be that the "Bretagne" carries so called *carronades à tourillons* along her gangways, over and above her rating, as indeed do all French ships, and that the forecastle chaser is not adopted for the upper deck, an idea being entertained that it would be soon disabled or neutralised by the rifles in an enemy's tops. The "Bretagne" stows three months' provisions for her complement of 1,200 men; the "Marlborough" four months' provisions; and, unlike the cramped-up quarters of the "Bretagne," where the additional funnel-casing greatly encumbers the space on all the fighting decks, and comes in awkward proximity to the main rigging on the quarter deck, as it does to this day on board our own "Agamemnon," where it has necessitated a wire rigging, everywhere on board the "Marlborough" we find abundant air, daylight, and room; her eleven hundred men can live

with comparative comfort on board; and, when the stern necessity shall arise, her hundred and thirty-one guns, we may be sure, will be manned as efficiently, and certainly quite as easily, as the like number of field-pieces would be handled on Woolwich common.

To make assurance doubly sure, in our next specimen of a three-decker, the engines now completed for the "Howe" and "Victoria" are of a thousand horse power, and the scantling of both ships considerably stronger, to bear the increased strain and percussion of their new armaments,—sixty-eight pounders on each deck.

With regard to those antipodes of the last class, the "Windsor Castle" and "Royal George," it would be very surprising if either turned out otherwise than failures, incapable of acting together in fleets, considering that one of them was launched and finished as originally laid down as sister ship to the "Queen," without being lengthened one whit to adapt her for the screw, and that the greater part of the main hold in both, is of necessity taken up with the engine and stoke-hole, encroaching on the stowage space and disturbing the builder's trim by their immense weight. Fitted and armed for sea, they are now what our ninety-eights on three decks were in the late war, apparently larger but in reality of smaller tonnage, and with a lighter broadside weight, than the French two-deckers of ninety-two guns, whilst the comparison as to steam speed is even less in their favour; in fact, they cannot prove else but fine sailing ships turned into bad steamers. It is more than probable, however, that, looking at all the circumstances, and well considering the advanced state in which one was on the stocks, and the expense of converting both into larger and more efficient ships, the means adopted with regard to them have been judicious. Besides which, the French, by whom we must of necessity regulate our classes, have done the same thing; the "Bretagne" being the only three-decker built for a screw, whilst the next in point of efficiency, the "Louis XIV." has only been lengthened a very few feet, and fitted with English engines of six hundred horse power, by Napier, which have enabled her to reach a speed of nine knots, with a light breeze in her favour.

From the following it will appear, that when the "Howe" and "Prince of Wales" are launched, which, according to the First Lord's statement, is to be this financial year, we shall have nine three-deckers afloat, it having been determined to razee the "Royal Frederick" into a two-decked ship; whilst the French by the same time will have seven.

Next in importance to these, the TWO-DECKER takes her station in the line of battle, and, if not deficient in steaming qualities, will doubtless be considered, what she was formerly, a good leading ship, able by her size and power to cope with the largest of an enemy. The two-deckers of the British Fleet may be divided into three classes: as the "Conqueror" of 101 guns, "Renown" 91, and "Cressy" of 81. Whilst those of France, always more uniform in every class, constitute but two distinct classes: as the "Ville de Nantes" of 92, and the "Donawerth" of 80.

Our first-class second-rates, as the "Saint Jean d'Acre," "Conqueror," and "Donegal," are fine and powerful ships, possessing, in as great a degree as the confined stowage of the screw-ship will admit, every requisite for prolonged and arduous service, sailing and steaming with the best of

those of France; but the present 91-gun ship, as exemplified in the favourite "Renown," is undoubtedly the finest specimen of a two-decked ship hitherto built. On every occasion when it has been her good fortune to be in company with ships of neighbouring powers, she has been alike the admiration of British and foreign officers. At the naval gathering at Cherbourg she and the French "Ville de Nantes," launched on that occasion, elicited the admiration of all the better judges.

As we have succeeded in securing a model ship of this class, possessing as much speed as the corresponding French ships, with improved engines of less power nominally, and occupying generally less room, we may conclude that such will be our future two-deckers; and accordingly the "Atlas," "Defiance," and "Bulwark," our forthcoming two-deckers now on the stocks, are all sister ships of the same horse-power. It is to be regretted that we have not a greater number of these immediately available, for Sir H. Douglas has well noticed that the inequality of speed of this class, the most useful of all for general purposes, will altogether prevent their acting together in fleets, or even in squadrons, where the movements under steam must of necessity be regulated by the slowest-going steamer. *

After a great many experiments the French have likewise secured an improved model from their early type the "Napoléon," originally with defective-geared engines with two funnels, which so strained the vessel as almost to use her up in the severe trials to which she was subjected.

The "Redoutable," "Algésiras," and especially the "Ville de Nantes," are all magnificent ships at this moment, directly available for any service. Three of this class, the "Arcole, "Algésiras," and "Eylau," in company and almost in line abreast, steamed from Algiers to Toulon in thirty-six hours in the course of last summer,—a performance unheard of before with ships so heavily armed.

In comparing the finest of the two-deckers of both fleets, as the "Renown" and the "Ville de Nantes," we shall not find the same difference as in the larger classes. Both ships carry their guns high and well out of the water, and have likewise very little sheer. The "Ville de Nantes" has her ports a few inches closer than the "Renown," but not so close as the other French ships of her class. Having been laid down in 1854, she has been designed from first to last as a screw-ship, with a round stern, and all the modern improvements. Her ports are pierced exactly like those of the "Renown," except on the upper deck, where they extend along the gangways. As the hammock-berthing is done away with in most of the recently-fitted English ships, it is evident that the "Renown," like the "Ville de Nantes," might mount eight or ten more guns. The "Renown" is however 10 feet longer at the load water line, and has 1½ foot more beam, than the "Ville de Nantes." Both are fast, steaming their 12 knots.

If we carry our comparisons to the masts, spars, and sails of the two ships, we shall find the same difference as is observed throughout the several classes of both nations.

The "Ville de Nantes" is taunter in her masts and has squarer yards than the "Renown;" her main truck is higher by 15 feet. Her lower mast-heads are slightly shorter than in the English ship.

* Naval Warfare with Steam. Sir H. Douglas. Page 82.

There is also a great difference in the size of the sails, which are still cut with a square leech; for, since the length and weight of the masts and yards of the "Ville de Nantes" are greater than they are in the "Renown," it follows that the spread of canvas must be greater likewise, and the centre of effort at a higher point; whilst the tendency of the "Ville de Nantes" to a little less breadth must tend, all things being equal, to operate against her stability.

As a rule, all the sails, with the exception of the courses, are larger in the French ships. The area of the topsails is greater; that of the top-gallant sails still more so; and that of the royals more in proportion than all the others. Looking at the lower rigging we find that, while the "Renown" is limited, as all our line-of-battle ships are, to nine pairs of shrouds, the French ships have still as many as ten and eleven; a fitment which, while it interferes with the line of ports on the quarter-deck of the "Ville de Nantes," must also act as an obstacle for a ship of war, by holding more wind, and offering a denser mass to the fire of an opponent.

The channels, fitted with iron gear, which would likewise occasion much damage if struck by a shot, are now all discarded in recently-fitted French ships, and replaced by the old-fashioned and more serviceable dead-eye. The main-stay, which in the "Renown" is of 5½-inch wire, is in the "Ville de Nantes" of chain, on that part coming immediately in the wake of the funnel; and, instead of being set apart as the topmast stays and fore and spring stays are with us, come so close that a shot striking the one would sever both. There is little to notice aloft apart from the general heaviness of the rigging of the "Ville de Nantes," except it be a sort of standing rolling tackles, or, more properly, preventer-lifts, on all the lower yards, and extra Jacob's ladders on all the lower tops leading on to the caps.

If we consider the 91-gun ship as the most useful of all the two-deckers, it will be curious to notice the tendency to weight and size since the introduction of the engine on board ship, for it is obvious that the best of these, the "Renown," "Orion," "Victor Emanuel," and three or four more, will be in future warfare what the 74's were of old, a sort of intermediate class between the liner and the frigate, possessing, as those did in the old sailing Navy, those two essential requisites, strength and activity combined—qualities which, apart from those of economy and expediency, will most assuredly not be found in the new razees of this class, as the "Queen," "Trafalgar," "Neptune," and the other sailing three-deckers cut down and converted into 91's, and fitted with engines of 500 horse-power; and still less in the 81's, which have been officially condemned *en masse* by the Surveyor of the Navy, in the extract read by the First Lord, on the question of the Navy Estimates. And here, as it bears upon my subject, I will quote the last paragraph.

"The latter, from their great age, are so defective that they will not be worth repairing after their present commission. To show the superiority of the French ships of the corresponding class 80 guns, it may be stated that five were reduced from 100 and ten from 90-gun ships, and are, therefore, not only more powerful sailing ships but better enabled to stow their machinery, &c. than the English 80-gun screw ships."

Now, I have not the slightest means of knowing who the Surveyor's

informant was on this occasion. It is the duty of our Admiralty to be informed of all that goes on in the French dockyards, and they doubtless know it well. But all I can say is, so far as it has come under my own personal observation, the extract is literally true. Some of the ships alluded to formed part of the *Escadre d'Evolution* under Admiral Romain Desfossés at Cherbourg; two of these, the "Eylau" of 92 guns, and "Ulm" of the same force, are conversions from sailing 100-gun ships, altered and lengthened on the stocks; whilst the third, the "Donawerth" of 80, carried the flag of Admiral Lavaud, the second in command, and lay abreast and off the central fort on the breakwater at the review. She, too, is a conversion from a 90-gun ship. All these ships have square sterns as the old sailing class, the round stern being only seen on those ships which were begun as screws. The "Tourville," which lay in ordinary on the north side of the second basin, fitted with an elliptical stern, a copy of our own, is another case in point. The whole of these ships have ample room for their machinery, as their dimensions could show; and which is certainly more than can be said of the "Colossus," "Goliath," "Mars," and a great many more, which a writer in the United Service Journal has held up as paragons of this class, and urged on the attention of the Surveyor of the Navy. It may be very safely asserted that such ships will never reach the fast two-deckers, and much less the magnificent transports, as the "Finisterre," "Arriège," and "Sêvres," of which the French now possess many; and which, singly or collectively, and heavily laden as they may be, each with its 3,000 men and 200 horses, are designed to outsteam any man-of-war, large or small.

Be that as it may, however, it will be found, by comparing the efficient two-deckers of the two nations, that they stand about on a par as to number; 28 on each side, if we include the "Duncan," "Hood," "Revenge," the two last launched this year, as well as the remaining two-deckers to be razeed into twos; the advantage on our side being in half a dozen 80's not included in that enumeration; a very unsatisfactory result, unprecedented in naval history since the days of Charles the Second, and which fully bears out all that has been advanced upon the subject by Sir John Pakington and Lord Hardwicke.

FRIGATES.—In enumerating the classes of frigates, I shall look upon the modern screw-frigate as likely to be in future actions what she was formerly, the eye of the fleet; and not more capable of entering into the line now than ever, which some think to be the case; an opinion which might have held good had the frigates and line-of-battle ships of other powers not increased in the same ratio as our own.

Apart from the large experimental frigates, as the "Orlando," "Ariadne," and "Doris," and the exceptionable "Termagant," about the size of a French corvette, English screw-frigates may be divided into two distinct classes—the "Emerald" of 51 guns, and the "Curaçoa" of 31; the French numbering two classes, in the "Impératrice" of 60 and "Isly" of 40.

The "Emerald" is the finest frigate of the fleet, her hull exhibiting the symmetry of the cutter, increased to the proportion of the frigate. Her

engines of 600 horse-power have averaged 13 knots; a greater speed than has yet been reached by any ship in the Navy, except the "Orlando," "Fairy," and "Banshee," and very superior to that attained by the two finest frigates of France, the "Impératrice" and "Audacieuse," both of 200 more horse-power. She carries coal enough for nine days' steaming, and seems to solve the one important problem, that both hull and engine must be equally perfect to carry into effect the full powers of both, and also restores in herself the former inequality of speed between the line-of-battle ship and the frigate, an inequality that ought still to exist in the Steam Navy; for it is evident that the "Chesapeake," "Euryalus," and "Impérieuse," having no advantage over the larger ships in this respect, are all liable to be overtaken and forced into unequal encounters with such vessels.

The "Emerald" is 2,913 tons—larger by 31 tons than Nelson's favourite "Victory;" though 25 feet longer at her load-water line than the "Euryalus," she has the same number of ports, 16 on her lower deck, thus increasing the roominess of her quarters and area of her decks.

In this respect she forms a striking contrast to the crowded quarters of the "Impératrice," which numbers as many as 24 ports on a deck only 2 or 3 feet longer, and where the additional length seems only to have brought on an increase of guns, and consequently of weight, which, without affording any influence in a fighting point of view, will more probably seriously militate against the equally-important question of speed and stowage; characters of immense importance in a man-of-war of any sort, but more especially in a screw-frigate.

The "Emerald" carries her portsills no less than 8 feet 10 inches above the water; she will consequently in bad weather be fully equal to an 80-gun ship. And of her we may justly say what was said of Sir W. Symonds's ships, that for that romantic beauty which makes a ship an object of poetry, and charms the eye of a seaman, like that of Cooper for instance, above every other object, no man-of-war or craft of any sort, French or English, can be compared to her. Indeed, as a whole, whether at anchor, reposing on her shadow, as Canning has so poetically expressed it, or bowling along under canvas, the 51-gun frigate of the Screw Navy must always appear the *beau ideal* of a ship, as long as the type of the beautiful afloat is supposed to be embodied in a ship very straight in her sheer, almost upright in her sides, and topped by three slender tapering masts, not overcrowded with rigging. The "Melpomene" and "Narcissus" are her sister frigates, and now figure as our adopted models, while the "Phœbe," "Phaeton," "Severn," and "Sutlej," fully lengthened, irrespective of expense, will prove if not equal to the "Emerald," at least only second to her, and there can only be one regret, that we have not a score more like them available for service. The French "Isly," named after that battle in "Algeria," won by Marshal Bugeaud, whose figure-head she bears, is an ugly but serviceable vessel, as are all the second class frigates in the French service. The "Impétueuse," "Impératrice," and "Audacieuse," the finest models of French frigates, are very splendid and powerful ships, looming in the distance like heavy liners; still the eye will, I venture to predict, fail to detect an "Emerald" among them.

CORVETTES.—Next after the frigate, and now almost imperceptibly merging into that class, both by their weight and size, come the corvettes, for such a frigate as the "Dauntless" would be considered a corvette in France; the largest of which, like the "Challenger," seem well adapted to share in the minor duties of the frigate class, whilst the smallest answer the purpose of the corvettes-avisos of the French. It must be within the recollection of all, how the little "Miranda" was chosen to be the pioneer of the Baltic fleet in the late Russian campaign, and how efficiently she did her duty.

English corvettes may be divided into three classes; as the "Pearl," of 21; "Miranda," 15; and "Racer," of 11; and the French into two classes; as the "Assas," of 16; and the flush-deck avisos-corvette, as the "Biche," of 10 guns.

The "Pearl" is the finest ship of her class yet built; she is 1,462 tons; within 100 tons of Mr. Pett's famous three-decked ship the "Royal Sovereign," built in the reign of Charles the First. She steams a full 11½ knots, and carries her guns high out of the water. To follow an example already given in the French corvettes à batteries-couvertes, as the "Assas" and the "Duchayla," the Admiralty built the "Clio," "Challenger," and "Raccoon," with a covered maindeck battery, being, to all appearance, frigates. It is to be regretted that the last of these vessels has turned out crank, and sails and steams very indifferently for a vessel of her class.

The "Orpheus" at Sheerness, but more especially the "Barrossa" now building at Woolwich, restored to a flush-deck corvette uncovered over head, lengthened a full 25 feet, and enlarged by some 300 tons, are however fully expected to meet all the new requirements of a first-class corvette, and to possess that one great qualification for a light cruiser, steam speed. It may be a consolation to know that, if we have not been very successful in this class, the French have fared no better; their best models are in every way inferior to our own, in speed, capacity, and the other attributes of a man-of-war.

After the corvette comes the BRIG; but this vessel is now discarded from the navy since the introduction of the screw; its place being supplied by the smaller steam-sloops and GUN-BOATS, a class of vessels which will prove very destructive for close in-shore service, for which they are especially designed.

It cannot be denied, however, that on the only occasion in which they were tried *en masse*, as at Sweaborg, their fire was a comparative failure. Numbers of officers, English and French, are unanimous in asserting that the good old-fashioned vertical fire from the mortars was alone efficient; and Sir Charles Napier draws attention to the fact, that had the contractor's mortars not been shamefully deficient, or their number too small, the whole of the defences, and even the island, might have been destroyed, and a passage opened into the harbour. It is certain that even now no very successful and definite model has been produced of a steam gun-boat, either here or in France. Their limited speed, compared to all larger than themselves; vulnerability to shot (for their safety will altogether depend upon the frustration of the aim of the enemy); the frequency of

their incurring damage in their engines, almost constantly out of repair, in any sustained operation; their fore-and-aft rigging, so little adapted to a war-vessel, cramping up the quarters; and their uneasy motion at sea, rendering both shot and gun almost uncontrollable in even moderate weather; all these concomitant disadvantages will much circumscribe the services of these vessels, if we judge of them as men-of-war, destined to perform the numberless duties that devolved on all the smaller craft in blockading service in the late war, and not consider them as packets, performing the remarkable feat, for vessels of only two inches keel, of going round the Cape.

It may be doubted whether the last French models are not, without exception, the very worst designs in either navy; and, if in trying to meet all these objections, the remedies are not worse than the evil. In the French service an idea prevails that the operation of gun-boats close inshore, or up rivers, might be altogether paralysed by a well-trained rifled musketry.

Having so far described each class from the two extremes of naval efficiency, the steam line-of-battle ship to the gun-boat, it will be apparent that steam has altogether inverted the ratio of speed that formerly existed between the different classes of men-of-war. With the sailing-vessel the principal aim being to obtain speed under canvas, with the means of readily manœuvring before an enemy, it became imperative to keep ships, especially line-of-battle ships, destined to act together in fleets or in squadrons, comparatively short, to enable them to fulfil these conditions to the best advantage; speed being obtained in the small vessel by the increased relative area of canvas spread; the cutter, for instance, spreading more than the brig of double her tonnage; the corvette, required of all others to be fast, doing the like by the same means. Thus in the old sailing navy we find the smallest vessel without an equal in speed when sailing by the wind, and even bearding the frigate in the chase; the heavy liners bringing up the rear slowly but irresistibly after the frigates and the corvettes, leaving these last the option and power of flight before an enemy superior in size.

The requirements of steam speed necessitating corresponding horse-power, and consequently greater space on board ship, have now entirely changed these conditions, and given that advantage to the larger vessels, to the obvious detriment of all the smaller classes.

In the early days of the screw propeller, our Admiralty, no doubt anxious to maintain the first relative speed unimpaired, seemed to have acted on this assumption, and accordingly we find the "Royal Albert," of 400 horse-power, with a speed of five or six knots; the "Impérieuse," of 350, with ten-and-a-half; and the "Highflyer" with the same; the whole averaging what at that time seemed a more than sufficient speed for any auxiliary or actual fighting purpose, and one and all lengthened just enough to admit the engine and boilers, and quite irrespective of the influence length might possibly have on the ship's speed, an influence at that time very imperfectly known but since ascertained to be great.

The exigencies of the Russian war in 1853-4 requiring a sudden accession of sea-force, and it being compatible with economy, a number of paddle-boat engines of weak power were forthwith turned over to some of

the 91's, which were being fitted in great haste to join the fleet. In every instance these engines have proved failures.

The "Megæra's" engines have proved so bad in the case of the "Algiers" as to make it advisable to discard them altogether for new and more powerful ones. Those of the "Vulcan" by Boulton and Watt, in the "James Watt," likewise proved so defective in her last commission, as to turn a very splendid ship into a slug; so that the sooner the like change is made in her, and also in the "Hannibal" and "Nile," the better will it be for their efficiency as steam men-of-war. Not so with the French; who, having a smaller *materiel* to work on, disregarding all minor considerations of economy, as they always do in aught pertaining to war, or where efficiency alone is at stake, and anticipating that speed either collectively or singly will in some degree hold the place of seamanship in action; and having moreover very different warlike requirements to meet, both in the narrow seas and on the ocean, with fast steaming squadrons of frigates and heavy liners, avowedly intended to skim the seas of everything weaker than themselves, to act against our coast, or in desultory operations on our commerce, gave their ships a horse-power since ascertained to be in excess of what their scantling could bear. Under such circumstances, and to be more on an equality, there seemed no help but to follow, and, however reluctantly, to partly adopt, the same system; and thus horse-power, tonnage, length, and unfortunately—for this is the most serious of all, and there is no help for it—draft of water also, have gone on increasing to meet the requirements of pending service. Sir H. Douglas, probably foreseeing the disadvantages in a tactical point of view, is most anxious that sloops and smaller vessels should be capable of exerting greater steam-speed than the liners, and that the former balance should be restored,* though there seems no clue how this desirable point is to be attained, unless by immeasurably increasing the size of ships of lesser rate, as the Americans have attempted to do, and as we appear to have successfully done in the "Orlando," "Mersey," and the "Emerald," but have failed as yet to accomplish in all our corvettes, sloops, and gun-boats; whilst the French have likewise further failed in their frigate classes.

Thus it remains pretty certain, that, whilst the motive power is steam, generated by the combustion of a fuel requiring enormous carrying space for stowage, and both engine-room and stoke-hole necessitate some two-thirds of a ship's hold, the screw man-of-war, from the line-of-battle ship to the gun-boat, can be no other than a very large ship.

In looking at the noble ships of each rate, now on the eve of being launched, and which from first to last have been designed as screws, without the patching and re-patching of necessity entailed on a converted ship, the principle of size seems fully carried out by the Surveyor of the Navy, and it will be seen that one and all, large or small, have now reached the length of some 300 feet; and it is furthermore evident, that, should the scheme of *revetting* ships with iron prove entirely successful in practice, ships of war will yet attain fabulous dimensions, as in the case of the experimental frigate now building at Bow Creek, whose length comes up to 380 feet.

And yet, with all these incontrovertible facts before us, the question is asked, and even repeated by some professional men, doubtless such who

* Naval Warfare with Steam. Sir H. Douglas, p. 83.

have not served of late, why we build such large ships? And we are even recommended to confine ourselves to those small two-deckers, which, as they say, did such good service in the Baltic, but which, as Sir Charles Napier observed, could neither sail nor steam.

Ships such as the "Ajax," "Blenheim," and perhaps the "Sanspareil," line-of-battle ships in name, without the power of a frigate, the worthy successors of the donkey-frigates, floating coffins of the sailing navy, and which in our coming struggles will be what the wretched 50's on two decks were in the late war,—neither able to come up to an enemy nor to run away from one, and so admirably adapted to bring disgrace upon the flag, and follow in the wake of the unfortunate "Jupiter," "Leander," "Guerrière," "Java," and "Macedonian." *

It is evident, therefore, that if there is one fact more satisfactorily established than another with the practical men of both nations, it is the one in reference to the question of bulk and form.

It has been proved beyond all doubt that rapidity of steaming is in proportion to increase of bulk, and our own and the French navy demonstrate this truism in the largest ship of every class.

The "Marlborough," "Ville de Nantes," and "Emerald," are alike remarkable for speed and handiness, and, despite their great length, a quality no longer objectionable in a ship-of-war having her motive power inherent in herself, each stays like a cutter, and turns easily in her own length; proving that, all other qualities being equal, so far as their dimensions have gone, size is favourable to velocity, and tends to economy of fuel, so much so as to make the small steamers of the paddle navy, even now, very expensive means of locomotion.

What more conclusive example can we have, when we see the noble "Renown," with her displacement of 4,890 tons, actually burning no more

* We are not sure of the author's meaning in this passage. Of the five vessels here mentioned the Jupiter only was a 50-gun ship on two decks. The force of the others mentioned, as compared with that of the vessels opposed to them, is thus given in James's Naval History:—

	Guerrière.	Constitution.
Broadside guns	No. 24	28
	lbs. 517	768
Crew (men only)	No. 244	460
Size	Tons. 1,092	1,533

	Macedonian.	United States.
Broadside guns	No. 24	28
	lbs. 528	864
Crew	No. 254	474
Size	Tons. 1,081	1,533

The comparative force of Java and Constitution was similar to that of Guerrière and Constitution, except that the Java had 100 men more than Guerrière. See vol. vi. from p. 150 to p. 194.

Leander fought Généreux for six hours:—

	Leander.	Généreux.
Broadside guns	No. 26	40
	lbs. 432	1,024
Crew	No. 282	936
Size	Tons. 1,052	1,926

See vol. ii. p. 340.—EDITOR.

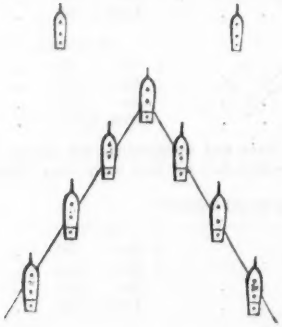
fuel to attain the same speed than the old paddle sloops of 220 horse power?

Another very remarkable application of this theory was exemplified in the passage of the fleet under Sir Charles Napier, through the Great Belt, in the first Baltic campaign, when the singular anomaly was presented of a fleet sailing in line a-head, led by the "Duke of Wellington" and "Jean d'Acre," under close-reefed topsails only, while the sluggards astern, mostly ships of the old construction, were actually obliged to spread courses, topsails, top-gallant sails, studding sails, and, in the case of the "Ajax," one of the old *forty thieves*, built in 1809, to get up steam to keep her station!

It is also true that nowhere will the change be greater than in naval tactics, for the aptitude of screw men-of-war for complex evolutions is so great, as to admit of combinations at sea similar to those hitherto practised on land. The illustrious officer of the sister service, to whom I have before alluded, and to whom the navy is so much indebted, has given us the first tangible theory yet propounded in either nation, in his admirable work on Steam Warfare, a work now well known both in England and in France, although I fear it is not so highly appreciated in the former as in the latter country, where it has excited an extraordinary sensation, and where all his suggestions are at this time in daily practice in the Toulon squadron of evolution.

Whilst scouting the idea, very prevalent with foreign officers, that steam will lessen the chances of England's supremacy at sea by enhancing the importance of military numbers, he eschews the parallel formation which has so often led to drawn battles and undecisive actions, where the enemy, if not completely beaten, boasted of a victory, as in the engagements between D'Orvillier and Lord Keppel, and the numerous other cannonades, or drawn battles, between Suffrein and Sir Edward Hughes, and he demonstrates beyond all doubt that an action gained by a steam fleet must always be attended by great results.

His own favourite formation, and one already anticipated in France, where I have seen it practised more than two years back in the squadron of evolution, the same which received the Queen at Cherbourg, is the *échellon order*, as it is called in military parlance, the *ordre endenté*, *lignes de*



relèvement, or *angles de chasses, en mouvement d'échiquier*, of the French naval code. By this arrangement, apparently the only possible one under steam, ships of war are no longer placed in the famous old line-a-head on the starboard or port tack, but in bow and quarter lines of bearing, that is, the bow and quarter of each ship face the bow and quarter of the one next to it.

We may fancy a fleet subdivided into three divisions, with the first ship of each division pointing towards the enemy, like the apex of a triangle, those astern on the port or starboard quarter forming the angles at the base. In this kind of order Van Tromp steered up the Channel in his retreat with his convoy in 1653. Admiral Cornwallis also conducted his celebrated retreat on this principle; and it was something like this that the two Admirals Moreno and Linois, when flying before the victorious Saumarez, intended to attempt, under sail; an intention baffled on every point by the vigour of the attack.

We may therefore suppose that the line of battle under steam will be analogous to the oblique order on land. Indeed, so anxious have French flag officers been on this point, that most of the manœuvres adopted as far back as 1840, in the successive squadrons of evolution, have borne some analogy to it.

Admiral Hugon more particularly attempted repeatedly to master *échellon* formations with his fleet; and his *angles de chasse en échiquier*, as they were called for the first time, were very effectually and creditably performed by his ships; but it was evident that the formation under sail would only lead to confusion before an enterprising enemy, and that a French admiral so acting would soon lose all command of his fleet, and produce the very *mêlée* he wished to avoid.

It remained for the screw to make it possible, and for Sir H. Douglas to be the first to perceive this, and to bring his experience and military science to bear upon the subject, by giving us all the combinations that *échellon* formations are capable of, and, as I had the satisfaction to tell him, he had stolen a march on all his younger contemporaries of either nation.

Let us hope that the result of the researches of this venerable officer, apparently in the full vigour of his intellect, will not, as has happened with the other improvements suggested by him, be first carried out by those who are to-day our friends, but who are straining every nerve to increase their efficiency, should we again meet as enemies.

As yet neither Admiral Freemantle nor Admiral Fanshawe have had any opportunity afforded, through the small number of ships entrusted to their commands, of carrying out any of his suggestions, and they are left in the deplorable position, through economy, clamour, fear, or what not, of confining themselves to the shifting of topsail yards, or of making, as I heard, barges simulate and play the part of line-of-battle ships and frigates. Whilst Admiral Jurien Lagravière, an officer full of zeal and enterprise for his profession, has at this present moment not a squadron, but a very respectable fleet, under his orders.

It results from such formations, to which the order of battle must now assimilate in both navies, that steam places his forces more at the disposal of a commander than formerly; but bearings may get hot at a critical time, shells may drop into the best masked engine rooms, as one did

manage to drop into the engine-room of the French liner "Charlemagne," at the naval attack on Sebastopol, and engines of the very best make by Maudslay and Penn, which answered well before, may fail at the hour of need. Nothing is more common than such failures with ships very actively employed, the troop transports for instance, and nothing can be done that will certainly avert them.

It remains still to be proved whether our noble bulwarks, our "Marlboroughs," "Renowns," "Emeralds," will stand the ordeal of the battle, or the vicissitudes of those long and dreary blockades, which were so nobly borne by their predecessors under sail; where the stowage of the ship was

PRINCIPAL DIMENSIONS of some of the most approved SHIPS of each Class in

	When Launched.	Vessel's Name.	No. of Guns.	Tonnage.	Displacement at Constructor's deep immersion.	Speed in knots per hour.	Length.			Breadth.			Depth of Hold.
							Outside all.	Between perpendiculars.	Keel for tonnage.	Extreme.	Tonnage.	Moulded.	
Three-deckers.	1855	Marlborough .	131	4000	6100	11½	286·4	245·6	205·0	61·3½	60·4½	59·6½	25·10
	1854	Bretagne . .	140	...	6850	11¾	300·	269·9	...	58·6	...	...	26·3
	1859	Victoria . .	120	4126	7000	...	300·	262·2	220·10½	60·0	59·2	58·4	26·10
Two-deckers.	1857	Renown . .	91	3319	4890	12½	281·	244·3	210·	55·4	54·6	53·8	24·6
	1858	Ville de Nantes	92	...	5050	12	260·	233·11	...	53·11	...	...	23·5½
Frigates.	1856	Emerald . .	51	2913	3921	13	271·	237·	...	53·6	...	...	17·8
	1856	Impératrice .	60	...	3796	11	...	240·	...	45·6	...	...	17·6
Corvettes.	1855	Pearl . . .	21	1469	2130	10½	...	200·	...	40·4	...	...	23·1
	Not yet launched.	Barrossa . .	21	1623	...	...	252·6	225·	179·7	40·8	...	..	24·2
	1854	Duchayla . .	16	...	2968	...	...	230·	...	32·0	...	...	22·
Gun Boats.	1854	Dapper . .	2	232	...	8	...	105·	...	22·0	...	...	8·
	1859	Coudon . .	1	...	85	6	...	80·	...	16·0	...	...	7·

not, as it is now, almost sacrificed to that intricate piece of machinery the steam-engine, and its attendant fuel.

Already, and with many both in England and in France, serious misgivings exist, for with all ships below a frigate catastrophes seem more than possible: their stern-posts, engine-room being so exposed, that their safety from an enemy's fire will often depend on a turn or two of the propeller; and Sir H. Douglas may be prophetic when he writes, "that there are indications that the result of a trial *à l'outrance* may not be satisfactory."* A corresponding authority in the French service urges the same

* Naval Warfare with Steam, p. 41.

the ENGLISH and FRENCH NAVIES in 1860—English Admeasurement.

Draught of Water.		Constructed,		Engine,	Horse Power.		Remarks.
Forward.	Aft.	Where.	By whose Draught.	Name of Manufacturer.	Nominal.	Indicates.	
25·	27·	Portsmouth .	...	Maudslay, Sons, & Field	800	2683	Converted from a sailing ship.
...	28·	Brest . . .	Jules Marielle	Mollat Indrêt	1200	2000	Laid down and built as a screw.
..	...	Portsmouth .	Sir B. Walker	Maudslay	1000	...	Designed as a screw ship.
24·	26·	Chatham . .	Sir B. Walker	Penn & Sons	800	...	Converted from a sailing ship.
..	...	Cherbourg .	Dupuy de l'Ome	Mollat Indrêt	900	...	Designed for a screw, improved Napoleon.
18·	19·	Deptford . .	Sir B. Walker	Miller and Ravenhill	600	...	Converted from a sailing frigate.
18·	19·	Toulon . . .	Dupuy de l'Ome	At the Creuzot	800	...	Built for a screw.
16·4	19·9	Woolwich . .	Sir B. Walker	Penn & Sons	400	1324	Built as a screw.
...	...	Woolwich . .	Sir B. Walker	Watt	400	...	Now building, probably the finest ship of her class.
...	18·	L'Orient . .	...	..	400	...	Designed as a screw; a very ugly ship.
...	6½	Merchant Yard	Sir B. Walker	...	60	...	One of the most successful gun boats.
...	4·9½	Bordeaux . .	Dupouy . .	Marseilles	H.P. 20	..	New gun boat with oaken screen, very crank, mounts a rifled 48-pr. ranging 7,000 mètres.

advice almost in the same words. One consolation however we have, that while we are liable to accidents with our engines so is the enemy; and, as in the old mode of warfare, the chances remain after all pretty well equalized.

Of all the intolerable evils entailed by necessity on the screw system, it is doubtful whether the smoke nuisance does not stand paramount; rotting both sails and spars, injuring the health of the top-men, and what is greatly more pernicious still, betraying the approach of a squadron, or even a single ship, for hours sometimes before the hull heaves in sight. It is impossible to have observed at least half a dozen sail under steam without being convinced that we have here a very serious drawback. Sir Charles Napier, it is well known, when in the Baltic, was so struck with the great disadvantages of this, in a tactical point of view, that he gave it as his opinion, that on going into action with a fleet, or even with batteries, such a smoke as the Newcastle coal generates would militate against the correct performance of evolutions, and that it was a matter of great importance that a remedy should be devised either in self-consuming or otherwise.

It is true that remedies have been devised which answer well on shore, or in the peaceful hold of a yacht, but which are quite inapplicable for service, by being heavy, cumbersome, and unmanageable when the ship is rolling, and which but very partially answer the main end—that of saving fuel. One gentleman, an inventor as he styles himself, indignant at having had his invention rejected, has written a pamphlet against a late Board of Admiralty.

I have made a great many inquiries of both English and French engineers, and they are all unanimously unfavourable to his invention, indeed a single look at the elaborate contrivance must convince any man the least conversant with the requirements of a man-of-war, that, apart from its inefficiency, it is quite inapplicable for service in the navy. These remarks are not made for the purpose of discouraging a projector who has had the praiseworthy motive of trying to do away with a great evil, but, on the contrary, to stimulate him and others to renewed exertions, and to show him that its accomplishment, if it be possible, is still a desideratum in the naval service of both countries.

I now conclude, though I should have liked, had time permitted, to have prolonged my researches into the armament of both fleets; for I have a very strong suspicion, shared I know by some of the best gunnery officers of both nations, that we are altogether on a wrong tack in adopting shell guns to the present extent.

Evening Meeting.

Monday, May 30th, 1859.

Captain E. G. FISHBOURNE, R.N., C.B. in the Chair.

NAMES of MEMBERS who have joined the INSTITUTION since 18th April.

LIFE MEMBERS.

Cave, L. T. Capt. late 54th Regt.
Turnor, H., Ens. Rifle Brigade.
Vivian, Sir Robert, M.-Gen. H.M.I. Forces.
Dugmore, W. F. J., Lieut. 3rd W. I. Regt.
Speer, W. D., Capt. R. E. Midx. Mil.

ANNUAL SUBSCRIBERS.

Mainwaring, C. E., Capt. R. A.
Petrie, M., Capt. 14th Regt.
Beresford, G. R., Capt. h.p. 7th Fus.
Walwyn, J. H., Lieut. 23rd R. W. Fus.
Paxton, A. F., Lieut. h.p. 11th Huss.
MacQueen, Jas., Capt. unatt.
Downes, M. F., Lieut. R. A.
Clement, C. J., Capt. Ceylon Rifles
Hammersley, Chas. Esq. (Sen.) Army Agent
Stockenstron, Sir A. Bart., h.p. Royal Corsican Rangers
Baker, W. E., Col. Bengal E.
Dames, T. L., Capt. R.A.
Feilding, Geo., Col. ret. Beng. Army
Fox, Edwin, Lieut. H. A. Company
Forde, M., Capt. 2nd Roy. Lan. Mil.
Wadman, A. J. P., Capt. K. Drag. Gds.
Jervois, Wm., Lt.-Gen. Col. 76th Regt.
Power, W. T. J., Dep. Com.-Gen. C.B.
Burroughs, F. W., Major 93rd Highrs.
Ballin, Geo., Qua.-Mas. H. A. Company
Macphail, John, Col. h.p. 7th Huss.

LIST of MEMBERS who have paid increased SUBSCRIPTIONS.

Baker, W. E., Col. Bengal E.
Graham, L., Lt.-Col. 19th Regt.
West, Charles, Esq., late R.N.
Wadman, A. J. P., Capt. King's Drag. Gds.
MacQueen, Jas., Capt. unatt.
Napier, Gerard J., Capt. R.N.
Clement, Chas. J., Capt. Ceylon Rifles
Hammersley, Chas. Esq. (Sen.) Army Agent
Stockenstron, Sir A. Bart., Capt. h.p. Royal Corsican Rangers
Dickenson, W. Esq., Lieut. Roy. I. Vol.
Cocks, P. R., Col. h.p. R.A.
Boldero, L., Col. late Gren. Gds.
Kennedy, G. R., Col. R A.
Paxton, A. F. Lieut. h.p. 11th Huss.
Wigram, J. R., Capt. late Cold. Gds.
Hawkins, F. K., Com. R.N.
Power, W. T. J., Dep. Com.-Gen. C.B.
Burroughs, F. W., Major 93rd Highlanders
Ballin, Geo., Qua.-Mas. H. A. Company
Rudd, H. Major ret. Bom. Army
Dixon, Manly H., Admiral
Lechmere, John, Lieut. R.N.

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	£. s.		£. s.
Boileau, C. L., Major unatt. .	. 1 0	Blakeley, A. T. Capt. h.p. R.A.	. 0 10
MacQueen, Jas., Capt. unatt. .	. 0 10		

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FLEXIBLE PROPELLERS.

By James Reddie, Esq.

Member of the United Service Institution.

When I had the honour of being offered the privilege of reading a paper in this Institution, on the subject of "Flexible Propellers for Boats and other Vessels," I ventured to accept that offer while I had every reason to believe that what I should have to communicate was perfectly new, and in hope that this novelty would go far to counterbalance all imperfections in my treatment of the subject; and I also hoped to have been able, not merely to propound a theory, but to communicate the result of complete and satisfactory experiments, establishing the usefulness of the invention. In both respects, I regret to say, I have been somewhat disappointed.

To find out that they have been anticipated is I fear the too common discovery of inventors; but it is equally a fact, that scarcely any of the most important and useful inventions have been brought to anything by those who first thought of them, but the same thing has had to be "invented" over and over again, before it has been adopted, or any practical results have been attained. Hence the national and individual claims and counter-claims, as regards the invention of the steam-engine, of steam vessels, the paddle and screw propeller, and even, at the present moment, as regards super-heated steam. With respect to the paddle-wheel, we generally associate it with the names of Miller, Taylor, and Symington, or Fulton, as the original inventors, and divide the honour between Britain and America; but about 100 years before, namely, in 1690, it appears that Denis Papin first proposed to use steam to work paddle-wheels, and it is asserted in a French work that Papin in 1707 actually propelled a vessel on the Fulda by an engine invented by Savery in 1702. The first patent granted for a steam-boat in England dates in 1736, to Jonathan Hulls, exactly 50 years before the successful experiments made with Miller, Taylor, and Symington's steam-engine, which is now deposited in the Patent Museum at South Kensington. I quote these facts from an interesting paper on the paddle and screw, read by Mr. MacGregor, barrister-at-law, before the Society of Arts on 14th April, 1858. I may observe, also, that it appears from the same paper, that, long before steam was applied to move paddle-wheels, the paddle-wheels themselves were used as a motive power for vessels, turned by means of manual or other labour, so far back as 1472, that is, 200 years before Papin; and a patent for such an invention was granted in 1618 to David Ramsey and Thomas Wild Gosse; but several modern writers are of opinion that the paddle-wheel was used by the ancient Egyptians, though Mr. MacGregor thinks this cannot be properly substantiated.

Few people, unless those who have given special attention to the subject, will be prepared to find, that what we generally consider the quite modern screw propeller is an old invention. The first name mentioned by Mr. MacGregor is again a Frenchman, — Duquet, who, in 1729, 50 years after

Papin's steam paddle-wheel, submerged an apparatus for propelling like a smoke-jack or windmill; and in 1746 Bouguer relates, that revolving vanes, like those of a windmill, had been tried for the propulsion of vessels. But it appears, besides, that in China the screw propeller is of indefinite antiquity. In 1780 a model of one was brought from that country. The first distinct description on record, however, of a screw propeller is that of D. Bernouilli, of Groningen, in 1752, which, it seems, was sufficiently matured to comprise the use of oblique vanes at the bow, sides, and stern, turned by a steam-engine, and capable of being hoisted out of the water. Mr. MacGregor (p 4) adds, "In 1768, Paucton proposed the pterophore, or screw thread on a cylinder, to be wholly or partly immersed. In 1770 James Watt suggested to Dr. Small the trial of a steam screw-propeller. Bramah in 1785 first patented a rotatory engine for this purpose; Ramsey (1792) put the screw between two hulls; and Lyttleton (1794) used a three-threaded screw; while Fulton (1798) tried one with four blades. Shorter's screw (1800), with a jointed shaft, and worked by men, was applied in 1802 to H. M. ships Dragon and Superb. The first screw steamer was tried by Stevens in America in 1804. In 1825 Brown used one on the Thames."

In art or science, or indeed any other human pursuit, it is scarcely ever wise to suppose we have arrived at perfection; and, before I quit the subject of the screw propeller, perhaps I may be allowed to state that within the last few weeks I have had an opportunity, through the kindness of a gentleman well-known in this place as the promoter of all that tends to scientific advancement in respect of ships and vessels—I mean Captain Fishbourne—of witnessing a series of interesting and important experiments with a new screw propeller invented by Mr. Soëlman, and which seems to possess many decided advantages over the ordinary screw propellers now in use. Strictly speaking, this new propeller is not a screw, —the blades not being twisted like the sections of a screw, but simply flat blades placed obliquely on their shaft, but of a peculiar shape, broader at the base than is usual, and, as a rule founded upon a proper theory, with the extreme corners cut off, and one corner of each blade more or less bent. With blades of this construction, which have this advantage, that they admit of being made of wrought instead of cast metal, Mr. Soëlman finds he obtains greater speed with four blades, like Fulton's screw, than with two, contrary to experience with screws of the ordinary shape. I cannot, however, dwell longer upon this subject, but I may be allowed to add that it was stated in to-day's "Times" that the screw of the Doris, one of H.M. ships, has had its leading corners cut off, with increased speed as the result, and that further experiments are to be tried with both corners cut off.

After these allusions to the well-known paddle and screw propellers, the efficiency of both of which for marine propulsion is so well established, it requires some degree of boldness to call public attention to another class of propellers totally different. When, however, it is considered that from 1618, when the first patent was granted to Ramsey for his paddle propeller, to June 1857, no less than 803 English patents relating to marine propulsion have been sought or granted, it is not to be imagined that all these inventions relate to paddles and screws alone. Without doubt the great majority of them are adaptations of these two; and after these, the most

numerous class consists of collapsing propellers of various kinds, in imitation of ducks' feet, sometimes adapted to be used as oars, sometimes as paddle-floats, and some even as screws. These propellers are called duck's-foot, swan's-foot, hinged, jointed, collapsing, &c. and frequently compared to the opening and shutting of the leaves of a book. They are all, however, obviously imitations of the motion of aquatic birds; and I confess I see nothing in the particular operation of nature which they attempt to follow, to promise great results, even could art and science entirely come up to nature, as we know it never does. Few things certainly are more beautiful than the "majestic swan," especially when, its feathers distended, it sails before the wind; but it, as certainly, is not a fast sailer; and when it makes most haste, and relies most upon its collapsing propellers for its progress, its motion is far from steady, or even graceful. The jerky speed it then attains is neither very great, nor worthy of being imitated. It is difficult to understand, therefore, why so much time and money and ingenuity have been wasted upon this particular kind of flexible or collapsing propellers. They seem to me, besides, objectionable for this additional reason, that, of necessity, they are not continuous in the propulsive force they exercise, and every one knows that continuity of force or pressure is the grand essential to produce velocity. This is peculiarly exemplified in the operation of the screw: its first few turns produce little or no effect, but motion once produced, slight increments of force continuously operate and add to the previous velocity, till a maximum of speed is attained, which has only a limit because at a certain speed the obstruction of dragging the screw itself through the water balances its propulsive power, which, again, cannot be increased by making the revolutions of the screw more rapid, because then it would cut through the water, and its "slip" become fatal to its progress.

It is, then, with a full appreciation of the truth and importance of these principles, which govern propulsive power, that I venture to bring under your consideration another propeller, different from any of those yet mentioned. It, too, is borrowed from nature; and, as the problem is how best to produce a motive power in water, it must surely be admitted that we go to a legitimate source, when we set aquatic birds and even amphibious animals aside, when we neither attempt to copy from the swan, the beaver, or the frog, but go direct to the fish. Here, indeed, if art and science will enable us to attain but approximate results, we shall have all we can desire. Every one knows the grace and ease, and marvellous rapidity, at times, with which the finny tribes move in their native element. When they make a dart, it almost seems as if it were a mere exercise of will, (as when one waves his arm,) without the necessity for propulsive power obtained by mechanical means, *ab extra*, from pressure against the water. But it is not so. The fish cannot move an inch by mere will. It is, as it were, in a state of equilibrium in the water. By its volition it can move its fins and tail—parts of itself; but all the motions of its whole body, from place to place, are merely mechanical results, the effects of pressure and resistance, produced by the action of the admirable instruments nature has endowed it with. The fish is as truly propelled by the action of a material propeller as a paddle-wheel or screw steamer. All that, by its volition, life and instinct, the fish accomplishes, is merely

analogous to the motive power of the steam-engine inside a vessel, while the paddle-wheel or screw, acting upon the water, does what is accomplished by the fins and tail of the fish, or, more strictly speaking, by its tail alone. We know the results. Nature beats art: and from this point of view the question naturally arises, why have flexible propellers, in imitation of fishes' tails, not been tried, before paddle-wheels and screw propellers were thought of? The fact remains, unquestionably, that the most rapid motion of a fish is produced simply and merely by the vibratory motion of its tail, and the continuous pressure thus exerted against the water; and the *onus* seems, therefore, thrown upon the inventors of propellers, to explain why they have so generally disregarded this most common example of nature. Surely the first propeller ever tried ought to have been a flexible, or fish tail propeller; and to a certain extent, perhaps, this has been the case; for what is the paddle of the Indian but a rude imitation of the action of a fish's tail, only with a very imperfect instrument? Amongst ourselves, a single oar is frequently seen, adroitly manipulated with the figure eight movement called sculling, and many inventions have been tried to produce the same results by machinery. So far back as 1745 Masson describes an apparatus for this purpose.* A patent for a similar invention was granted to W. Taylor and H. Davies in 1836; † another in 1840 to William Mill;‡ and another so recently as 1847 to Jean Charles Victor Coullon. § From the description of these patents, as one might have anticipated, the machinery is necessarily very complicated to produce so complicated a motion; and, after all, there is the same objection to them that was urged against the collapsing propellers, namely, the want of continuity in the pressure they produce, and the consequent loss of time between each effective stroke of the blade or paddle. Few attempts have, however, been made to follow nature—always perfect in its simplicity, and simple in its perfection—with greater closeness. Very few seem ever to have thought that by means of a flexible paddle the same, or rather a greater, effect would be produced than by sculling with a rigid blade, and that without the necessity for any such complicated movement. I say, few seem to have thought of this; and, for a whole month after the idea first occurred to myself, I was led to believe that there was no trace whatever of any patent for or other record of such an invention. ‖

Do not suppose for a moment that I intend to inflict upon you the records

* Abridg. of Specif. of Patents for Mar. Propul. vol. i. p. 25.

† Ib. vol. ii. p. 126. ‡ Ib. p. 156. § Ib. p. 206.

‖ A short notice of this paper having appeared in the Mechanics' Magazine of June 10, 1859, Captain Selwyn, R.N. wrote to the editor on the subject (*vide* Mec. Mag. 1 July, 1859), to the effect that it is "scarcely correct to assume that the 'fish-tail' form of propeller has been so much overlooked," and referred to the new edition of Tredgold's work, Appendix D. As to this I can only say I have noticed every instance in the Abridgment of Specifications, and indeed the fact that, except in the last edition of Tredgold's work, such propellers are not noticed at all, shows how very little attention has been given to this kind of propeller. Captain Selwyn also proposes a very ingenious mode of combining the screw and fish-tail, as to which reference is made to his interesting letter and the diagram which accompanies it; but I fear such a compound propeller would be still more liable to "foul" than a screw by itself, and could not be afterwards cleared without still greater difficulty.—J. R.

of a grievance. It is true I invested some ten pounds in securing provisional protection from the Commissioners of Patents for what I had then every reason to believe was really a new invention; but I never, from the first moment, arrogated to myself any merit in the matter, for I always regarded it as by a mere accident, which, indeed it was, that I had been led to think of it. I have, also, a most wholesome dread of an observation of Mr. Scott Russell's (made at the meeting of the Society of Arts at which the interesting paper from which I have quoted was read by Mr. MacGregor), "that the faculty of mechanical invention was not a very unusual faculty; that it belonged to nearly everybody, and that it was one of the greatest misfortunes that could fall upon a man when he took it into his head that he was endowed with a larger portion of that faculty than any one else." (p. 7.) I certainly do not go quite so far as Mr. Russell, when he adds, that "there were men in this country who could invent anything they were asked for, and all we had to do was to pay them for inventing." (p. 7.) This is surely decrying one's own art, and is a somewhat too mercenary view, if I may so say, of the motive power of the inventive faculty; still, every one will admit, that it is not to be expected that every private individual can afford to make expensive experiments, in order to mature some invention, without a reasonable hope of some return. But, in truth, instead of inventors being such mercenary beings, they are rather too much given to ride their hobby at all hazards, and so get involved in difficulties; and many a caution I have received from those experienced in such matters, "not to be too sanguine;" "not to incur much expense;" and even "not to ruin myself," in trying to carry out my invention. I am not likely to do so; in fact, I cannot afford it. If a reference to the Index of the "Abridgment of the Specifications of Patents relating to Marine Propulsion,"—an epitome of information most justly praised by Mr. MacGregor as a means for preventing ingenuity, time, energy, and private expenditure being needlessly thrown away by inventors discovering over again what had been already invented,—did not enable me, or the patent agents I employed, Messrs. Newton, of Chancery Lane, to discover that I had been forestalled; yet, by reading through the Abridgment itself, I discovered that such was the fact, in very good time, before my expenditure had been excessive; so my grievance is a comparatively slight one. I do not wish here to raise any question as to the propriety of granting "protection" when it is doubtful whether a patent could be maintained; and, at any rate, there is this to counterbalance any disadvantage I labour under in thus confessing my invention is not quite new, that I am no longer the mere exponent of my own views, but am able to place self aside, and speak in favour of the flexible propeller on more independent grounds.

It is a somewhat curious circumstance that the only propellers in the "Abridgment of Specifications" which are called "fish-tail" propellers, are indexed under the title "Propeller, Screw." The first is in 1841, to William Joest, called "the double fishes'-tail," "composed of a prismatical hollow solid," which is a "bent vane on a vertical axis, and which *revolves* under water" (p. 162). It will be admitted that no revolving propeller can be considered as having any resemblance to the action of a fish's tail. The next (also in 1841) is to John G. T. Campbell, and is called "a

whale-tail or fluke propeller." It is thus described in the Abridgment (vol. ii. p. 164):—"Two flap-like vanes, swinging fore and aft on horizontal axes, are so moved under water in an aperture through the dead-wood at a vessel's stern, as to imitate the motion of the tail of a fish, when the broad surface is nearly vertical and across the direction of the fish's length. This is done by an arrangement of levers and jointed 'knuckles,' the action of which is explained by the drawings."

This, it will be observed, is also rather complicated, and scarcely the fish-tail *au naturel*.

But, leaving the Index, and proceeding to the text of the Abridgment, at p. 16 we find that in 1683 Borelli of Rome describes a submarine vessel, "navis urinatoria," which he had invented, to move by fins or collapsing oars; but he adds that, instead of these, probably an easier mode of propulsion would be by one flexible oar acting like a fish's tail.

The next trace to be found in the Abridgment is at p. 61, Patent No. 3,909, 25 April, 1815, to Sam. J. Pauly and Durs Egg, for an aerial machine with feathery wings; to which is added, somewhat vaguely, "2. The patentees declare that the same principle is also applicable to the propelling of vessels through the water." I think we need not be surprised if this vague claim was not considered a proposition for a fish-tail propeller, or indexed as such. Neither would it be supposed by many that it was practicable either to move balloons by means of imitative fish-tails, or boats with imitative wings. And yet, upon reading these inventors' full specification in the Patent Office, I was astounded to find that, with this mere hint of such a possibility, he claimed such a universality of patent right, to apply to vessels, wings, feathers, fins, fans, and even tails, that I brought away with me a copy of his specification as a curiosity, and I beg to be allowed to read an extract from it, alike as an encouragement and warning to all inventors:

[*An extract from the Specification was here read.*]

It must be remembered that this sweeping privilege was granted; and certainly nothing can be easier than to be an inventor and obtain patent rights in this exclusive style, if only first in the field, and nothing more difficult, on the other hand, than to become an inventor and patent an improvement, if such exhaustive previous claims are meant to be sanctioned.

I may state that having often observed that percussion caps were stamped D. EGG, and remembering the same letters on fire-arms and the window-sill of a shop in the Opera Colonade, I was induced to call there and inquire whether anything was known of Durs Egg, the inventor of this flying balloon, and of the invention itself? I found that he was an ancestor (father or grandfather) of the present Mr. Egg, gun-manufacturer, and that the balloon in question, which cost a great deal of money, was sold for a song at the death of Durs Egg, the inventor. So far as I could learn, it had not been attempted by him to apply it to vessels in water, notwithstanding the terms of the patent.

The next propeller of the kind is patented by James Dawson, 14 March, 1816, No. 3,996, only a year after, and notwithstanding the sweeping patent last mentioned. It is in the first place, and chiefly, for a rotating flexible propeller, and only, as it were, by-the-bye, for what I conceive to be the most valuable invention, a vibrating fish-tail propeller. In the

Abridgment it is merely described as "A paddle or screw propeller of elastic rods, covered with fan-like elastic pieces of canvas or similar material;" but upon obtaining the specification itself from the Patent Office, I found that it was veritably a fish-tail propeller, such as I imagined I had been the first to think of. We shall revert to Dawson's invention bye and bye; in the meantime I will shortly allude to the two only other inventions of the kind which appear in the Abridgment. In 1824, Nov. 11 (No. 5,053), p. 78, William Busk obtains a patent for "An elastic plate fixed to an axis at one end, which is caused to vibrate back and forward in the water. The axis may be horizontal or vertical." And so late as 1854 (June 2, No. 1,224), p. 263, the Earl of Aldborough patented "a vessel propelled by wing-like sails, urged by springs in conjunction with vacuum chambers and numerous other contrivances described at length; and in another form the propulsion is effected by an elastic propeller, acting in some manner like a rudder, and with or without valves, not particularly explained." He refers to a previous patent (1854, No. 224,) referring only to aerial locomotion, and I have therefore not thought it necessary to procure the specification of this invention.

Dawson may in fact be said to be the only person who has anticipated the invention, the claims of which to your consideration I venture to speak of. He patents three inventions: 1st. elastic floats for paddle-wheels; 2nd. elastic masts and sails; and 3rd. (with which we have to do,) an elastic lever or oar, with one end formed somewhat in imitation of the tail of a fish.

[*The Specification was here read.*]

I confess I do not understand what advantage he expects to gain either by the elastic plane, which he states he *sometimes* attaches to the handle, nor why he proposes that the handle, lever, or oar itself should be flexible like the backbone of a fish, with a vertebral action. The vertebræ of a fish are used to bend the body of the fish itself, and they have an elasticity and spring which no doubt greatly facilitates the various curvelinear motions of the fish in the water, but for a mere onward movement they are not required; and if a lever or rod to which an imitation fish-tail is attached were jointed and rendered elastic in this manner, it would only weaken its power for causing the tail part, in the water, to vibrate to and fro with sufficient force against the water's resistance. This being the case, I doubt very much whether Dawson ever made any experiments with such an elastic oar.

As regards the moving of his flexible propeller, Busk seems to have had a more practical view than Dawson. Busk's propeller is simply an elastic steel plate, which he proposes to attach to vessels like a rudder, and work it from side to side either with a tiller by the hand, or with the aid of machinery, without any complicated details for obtaining a closer imitation of the power of a fish's tail. Any one can at once perceive that to move such a propeller in the water an elastic or bending tiller would not give the helmsman greater power, but the reverse.

[*Busk's Specification was also read.*]

Let us now inquire what distinct advantages this mode of propulsion seems to promise, and what difficulties are to be overcome in attaining them.

In the first place, I suppose it may be assumed, that the moving from side to side of a flexible paddle, or rudder, at the stern of a vessel, will propel the vessel. But not only so: this motion of a flexible propeller will be found to have little or no retarding influences to overcome; its every action is propulsive, partially, no doubt, (like the oar in sculling, or the screw propeller,) in an oblique direction, but also in a great degree directly in the direction of the vessel's onward motion. In the next place, from the position of such a propeller, submerged at the stern of the vessel, with the centre of the propulsive force level with the centre of gravity, the stable equilibrium of the vessel is not disturbed, and there is no waste of power, such as there is in sculling, which pulls the boat down against the water as well as onward; and as there also is in the paddle-wheel, unless when made to feather by complicated machinery; and as there is even in rowing, the action of the oars being chiefly oblique, except at the moment when at right angles to the boat, while even then a great part of the pressure tends to pull the boat downwards to the water, as may be observed by watching the rise and fall of a boat between each stroke of the rowers.

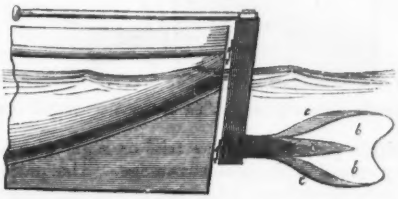
Before extending the comparison further to the screw, I would beg to point to some special advantages such propellers would have for boats. By means of crank machinery and multiplying power, I venture to anticipate that one or two men might do in a boat, to which steam machinery could not be applied, as much as is now accomplished by eight or ten rowers. Boats so propelled could also move up creeks and narrow rivers, where oars could not be used; and, for war purposes, it must be manifest that a boat with a crew of riflemen must be far more formidable than one encumbered and chiefly filled with a dozen rowers, with their backs exposed to the fire of the enemy. Such propellers could also be used in boats in aid of sails, which oars can scarcely conveniently be, both on account of the position of the rowers, and also the jerky and unsteady motion of rowing.

It was, indeed, almost solely as a substitute for oars that, in the first instance, I considered the fish-tail, or flexible propeller, would be found useful; and it has only been as such that I have as yet made any experiments. I had no models made. As the operation of such a propeller is very simple, I resolved, from the moment the idea struck me, to have one fitted to a boat, and prove the value of the invention by coming down the river. I have already expressed my regret that I had not been able to realize that idea. And, indeed, after I discovered that Dawson and Busk had anticipated the invention, I shrunk from appearing here this evening, with no very practical results to communicate. But the fact that these anticipations may probably prevent my laying any exclusive claim to the invention is, on the other hand, one of the most cogent reasons for making it more generally public, that others who have more time and money, and greater mechanical skill, may be induced, if so disposed, to undertake the task—which I think would be a most interesting one—of working it out to a practical result.

Those who are fortunate, or unfortunate, enough, as it often happens, to be inventors, have generally a difficulty as to the construction of their models, or mechanical contrivances. To whom to apply to make a fish-

tail was also my difficulty. For a first experiment, however, I did not hesitate. I went to a small gutta-percha shop, and had a fan or tail made, with a piece of wood for its narrow and rigid part; but this propeller turning out rather flabby, I strengthened it with additional pieces of gutta percha in the middle, leaving spaces between these layers for inserting ribs of steel, should that be found necessary for further strength. (*Vide* figure.)

Fig. 1.



FLEXIBLE OR FISH-TAIL PROPELLER AND RUDDER.

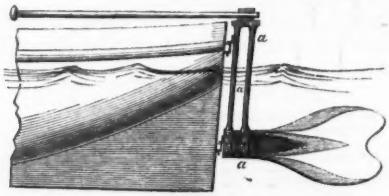
A. Wooden portion attached to ordinary rudder-stem.
b. Fish-tail paddle of single thickness of gutta-percha.
c, *c*, *c*. Portions of ditto, which are of double thickness.

The size of this propeller was—extreme length 2 feet, greatest width about 15 inches. Its narrow and rigid part was tapered down to an average breadth of about 4 inches. This part, made rigid with wood, I had nailed to the rudder of an ordinary four-oared boat, and the propeller extended beyond the rudder about 18 inches; but I confess when I saw the size of the boat, 24 feet long, and looked at the slightness of my propeller, I anticipated a total failure. But it was not so. Notwithstanding an inconvenience in working the iron tiller I had made, which was not quite suited to the stern of the boat, to give it free action, this slight, flexible propeller managed to keep the boat up against a strong tide and sharp head-wind, and to make a little way. I found it also a considerable auxiliary to the oars, when the boatmen rowed against stream; but the boat being out of proportion too large, I gave directions for the propeller being attached to the rudder of a smaller one, for another trial. This boat was what is called a funny, with an extremely raking stern-post, or, rather, no stern-post at all, but rather the keel continued, its bow and stern being shaped and sloped alike. With this boat, the action of the propeller being upwards, rather than onwards, it lost all the advantage of one of its special characteristics; and, if the tiller was moved three feet from side to side, the propeller was lifted obliquely out of the water, almost altogether. This necessitated me to confine my operations to a very limited vibratory motion, and so far an advantage was obtained by this trial; for, contrary to my expectation, I found that even a very slight movement of this kind, made with rapidity, gave considerable propulsive power, while I had hoped for the greatest results from the effective stroke at each turn of the propeller.

In making these trials it was further evident that attaching the propeller to the rudder was but a clumsy expedient, and that, of course, the obstructive effect of the flat rudder moving to and fro in the water was

considerable. I had, therefore, an iron skeleton-rudder formed, (fig. 2) with one fixed and one moveable pintle, in the hope of its fitting any boat, and of

Fig. 2.



a, *a*, *a*. Skeleton rudder substituted for the ordinary rudder of the boat.

giving my primitive propeller a fairer trial on a gig with a vertical stern-post. In this I found a decided advantage. The propeller was moved with a facility and effectiveness I had not before experienced. There was a drawback, however, in the moveable pintle, which allowed too much play at the hinge, or axis of the propeller, and the boatman being extremely fidgetty about the gudgeons and paint of his gig, I was induced, instead of endeavouring to prevent this play of the pintle, to shift the propeller to an old, but much larger, boat, which had also a nearly upright stern-post, full of confidence that now I could almost have propelled a barge! A few sweeps of the tiller, however, brought my experiments to a sudden close: the woodwork of the propeller had given way, and I was obliged to unship it, pull to the shore, and walk away, extremely chagrined, carrying my unfortunate tail behind me. An accident of this kind, it may be remembered, was a fortunate circumstance in perfecting the screw propeller; but I can boast of no such good chance.

I then resolved to have a boat of my own, and a new propeller, or rather propellers, of various shapes and degrees of strength and flexibility; but I will not take up your time, or abuse the indulgence you are so kindly and patiently according me, with the details of the delays and disappointments I then experienced, while in the meantime I made the discovery that others had preceded me, and that after all it was very questionable whether, even if I succeeded in overcoming every difficulty, I could reap any other reward for my pains. This consideration, however, would not have prevented me persevering; for, as I have said, I do not quite hold Mr. Scott Russell's doctrine of mercenary motive power, though I confess that it somewhat damped my zeal, and induced some caution as to expenditure. At the same time unexpected business engagements came upon me, followed by the war, which (as connected with one of the civil departments of the navy) created fresh and imperative demands upon my time; so that, though most willing, I have been utterly unable to attempt more as yet.*

* Since this paper was read, a friend—an officer of H.M.S. Formidable—who takes an interest in this matter, has had propellers made with steel ribs, separated at the stern-post, and joining at the extremities, like the bones of a fish's tail, the "flabby" part of the propeller being made of vulcanised india rubber, or canvas, and experiments are now being made with these propellers—J. R.

One word as to the application of flexible propellers to larger vessels, to be moved by steam machinery. Can it be expected that they would have advantages over the screw? In the first place, even if such a propeller were only a simple elastic steel plate, without any other contrivance to obtain the many wonderful powers of the fish's tail, its action would probably equal the screw in efficiency for ordinary speed; but, besides that, it promises almost an indefinite increase of velocity by means of more rapid vibrations, as it will have no slip, and presents no opposing surface, like the blades of the screw, to be dragged against the water. For the same reason, it will be a more efficient auxiliary to sails than the screw propeller can ever be; and, when not used as an auxiliary, it will not, like the screw, obstruct the course of the vessel when moving under sail alone. These appear to me to be no slight advantages, and they might, of themselves, well induce those who could afford it, who are interested in the progress of scientific navigation, at least to make experiments. I need scarcely add, that such propellers are at once propellers and rudders, and that the steering power of a vessel so propelled will be immense, and may be employed to turn a vessel when at rest, as one sweep of the propeller would put way on the vessel at once, and, if not reversed, would move the vessel to one side. It is obvious, however, that in all that has been said of this propeller, no means for going astern has been provided. That is quite true; but the point has not been overlooked, though it would add inconveniently to the length of this paper to deal completely with the subject now. I will, therefore, only observe that it is of secondary importance, compared with increased speed forwards, and that, even without any appliances for backing, the greater ease in turning a vessel with a flexible propeller, will, in a great measure, of itself counterbalance any such disadvantage.

But to conclude. It is a most natural question to ask, Can we hope, by artificial means, to attain, even approximately, so complete a propulsive instrument as nature has supplied to the fish, and thus rival its wonderful rapidity? I do not for a moment suppose that we ever could obtain a power like that of the salmon, by which it performs the most extraordinary feats, both in darting and leaping; but, for a steady, rapid, onward motion, we have every reason to expect we can. We cannot hope to rival the marvellous combination of flexibility and strength we find in the salmon's tail; but, if in that nature has the advantage, on the other hand it will be found that, in some respects, for such a propeller, science has the advantage even over nature. I trust this observation will not be misunderstood. Nature and true science are never antagonistic. I was alluding to the power of the steam-engine, by which our inferior propellers could be driven to and fro in the water, with a force and rapidity, and unflagging continuance, that not even the strongest and swiftest fish could ever exert. In this, science would have an advantage, which would compensate, and probably more than equal, the disadvantages of our inability to come up to the marvellous mechanism of nature in the construction of the fish's tail. And this is no foolish boast; for what is that science which accomplishes such results? It is merely the application by man, "as the minister and interpreter of nature" (as our greatest philosopher designates him), of other powers of nature, fulfilling the will of the Omnipotent. It is thus that

"knowledge is power." It is not art alone that drives the steam-engine; it is the expansive power of heat acting upon water, directed through man's knowledge and art, to do his will, but the power so potently exerted is after all a simple power of nature. And so with the still more powerful agency, which is frequently under the consideration of those connected with this Institution, and which, as we now speak, is carrying death and destruction elsewhere, and even thus affecting the present and future fate of nations. It is not art alone by which the ball from an Armstrong gun parts from its muzzle like a thunderbolt, and shatters all that would resist it: it is only art, after all, using and directing one of nature's most mighty agencies; and, in short, it should never be forgotten that, in all science, nature's power must be predominant, and that it is man's most legitimate province to render all the powers of nature subservient to his use by means of knowledge and art. True science ever and only exhibits the marvellous powers of nature, combined with art and skill, in harmonious co-operation.

Mr. MacGregor.—With respect to the question of the fish-tail propeller, it is very difficult to speak of it unless one is in a boat in which it is tried: I think it is a mistake to compare it to any other mechanical arrangement for a similar purpose. Its action is of an exceedingly complicated kind; but I would give a word of encouragement to Mr. Reddie, not to be disheartened because others have been in the field before him. I must say that if they are able to give us as intelligent an account of their inventions as he has of his, they will produce significant results.

Chairman.—The subject is a very important one, since we all know or have experienced how numerous are the accidents which occur to the screw, and that, in some cases, there are no results commensurate to the enormous powers used. There is another disadvantage in the screw, viz., that it is scarcely applicable to light-draught vessels; yet we are going very much in the direction of light draught. Such vessels will be immediately necessary for the defence of our coasts in case of attack; and there is scarcely any part of the world where light vessels with such a propeller as this would not be of very great utility. We saw during the late operations at Canton that, while every one of our screw vessels broke down, an old paddle-wheel steamer, doing ten times the work, remained serviceable to the last. Mr. Reddie has read a very interesting paper, exceedingly well reasoned out, and it cannot fail to afford considerable instruction, especially to those experimenting on any similar contrivance. I must, therefore, return him our best thanks for his very interesting paper.

Mr. Austin exhibited and explained an apparatus of his invention for raising vessels sunk in deep water.

The Journal

OF THE

Royal United Service Institution.

VOL. III. 1860. APPENDIX.

PROCEEDINGS OF THE TWENTY-NINTH ANNIVERSARY MEETING.

A GENERAL MEETING of the Members of the ROYAL UNITED SERVICE INSTITUTION was held in the Lecture Theatre of the Institution, Whitehall Yard, at Two o'clock P.M. on Saturday the 3rd of March, being the Twenty-ninth Anniversary Meeting.

The Right Hon. the EARL DE GREY and RIPON, Under-Secretary of State for War, in the Chair.

I. The Proceedings of the last Anniversary Meeting were read.

II. The CHAIRMAN said—

It now becomes my pleasing duty to lay upon the table the Royal Charter of this Institution. I am confident that I speak the sense of all present in congratulating you upon the fortunate circumstance, that this Institution, so valuable as I believe it to be to the united services of the Army and the Navy, has received this mark of Her Majesty's approval. That approval will be appreciated nowhere more highly than among the members of these two services; and I rejoice to think that by thus placing—if I may so say—her high seal upon this Institution, Her Majesty has been pleased to signify that she approves of the efforts which you are making for the spread of scientific knowledge, for affording opportunities of information to the members of both those services, upon whom Her Majesty, in times of danger, will be able for the future, as she has in the past, always to rely with certainty. I will now call upon the Secretary to read the Annual Report.

III. The Annual Report of the COUNCIL was read as follows:—

1. In submitting the Twenty-Ninth Annual Report of their Proceedings, the COUNCIL have the satisfaction of announcing that Her Majesty has been graciously pleased to grant a Charter of Incorporation to the Members, and that the United Service Institution commences the Thirtieth year of its existence as one of the established Royal Societies of the Country. The COUNCIL confidently call the attention of the Members to the steady and decided progress which the ROYAL UNITED SERVICE INSTITUTION exhibits in all its departments; and, though there is no doubt room for still further improvement in organisation, yet its design has been considerably developed during the past year, and its efficiency materially promoted.

2. It has been the earnest desire of the COUNCIL, to conduct the affairs of the Institution in such a manner as to make it of practical utility to the Members, and worthy of their support. The COUNCIL are satisfied that their exertions in this respect have to a great extent succeeded, and that the reputation of the Institution has increased in the estimation of the professions.

3. Although much has been done within the last three years in extending the resources of the Institution and enlarging its sphere of action, much still remains to be accomplished. The expense both attending, and consequent upon, the alterations which have been carried out has been great, and the COUNCIL have other improvements in contemplation, which they believe will augment the efficiency of the Institution, whenever its financial condition will admit of their being proposed. They therefore again express their great anxiety to obtain the cordial co-operation of Officers of rank and influence, the value of whose moral support cannot be too highly appreciated.

THE MEMBERS.

4. The increasing disposition to join the Institution which was displayed in 1858, and which the COUNCIL noticed with so much pleasure in their last Report, continued during the past year. The number who enrolled themselves as Members in the year ending 31st December, 1859, is 195. The loss which has been sustained by death amounts to 84; the withdrawals to 13; the increase upon the year is therefore 98. A detailed statement of the changes among the Members, and the Tabular Analysis, appear in page xxvi.

FINANCE.

5. The COUNCIL now submit the General Abstract of the Accounts for the year 1859, as audited on the 16th of February, 1860 (see opposite page).

Receipts.

6. The ordinary receipts have exceeded the amount estimated by £140. Liberal donations have further augmented the income of the year by £113

GENERAL ABSTRACT OF THE ACCOUNTS OF THE UNITED SERVICE

GENERAL ABSTRACT OF THE ACCOUNTS OF THE UNITED SERVICE INSTITUTION
FROM 1st JANUARY TO 31st DECEMBER, 1859.

EXPENDITURE.	Amount. £ s. d.
Secretary's Salary	150 0 0
Clerk's do.	72 0 0
Servants' Wages	302 15 6
Do. Clothing	36 8 0
Fuel	36 4 0
Lighting	20 3 6
Postage	64 11 6
Fire Insurance	29 5 0
Library	84 0 7
Journals	690 18 4
Advertisements	29 2 6
Artificers, Carpenters, Ironmongers, Painters, Glaziers, &c.	151 10 3
Stationery, Printing, Circulars, Tickets, &c.	101 0 8
Lectures	17 9 4
Income Tax for Clerk and Porter	5 1 6
Parish Rates	90 12 6
Water do.	10 0 0
Assessed Taxes	92 16 7
Ground Rent	197 16 0
Catalogues of 1849	26 18 0
Domestic Sundries	10 12 3
Miscellaneous	52 14 10
Annuity to Malcolm	20 0 0
Stamps	0 9 1
Total Expenditure	£2,292 9 11
Cash repaid to Agents	4 0 0
Invested in purchase of Consols at 97¼	495 1 2
Balance at Bankers 31st December, 1859	46 1 1
Total	£2,837 12 2

RECEIPTS.	£ s. d.	£ s. d.	Amount. £ s. d.
Balance at Bankers 31st December, 1858			48 11 2
Annual Subscriptions at 10s. for 1859	1,109 5 0		
Do. do. above	331 13 0		
Do. do. arrears	50 0 6		
Do. do. advance	35 10 0		
		1,526 8 6	
Entrance Fees		195 0 0	
Donations		113 14 0	
Grant from Government		400 0 0	
Life Subscriptions		512 0 0	
Dividends		12 17 6	
Sale of Old Cases		4 0 0	
Sale of Journals		25 1 0	
Total		£2,837 12 2	

London, 16th February, 1860.

Examined and found correct, THO. SMITH. J. E. A. DOLBY. } Auditors.

(see page xxvii.). Two hundred and eighty-four Members have increased their Annual Subscriptions from Ten Shillings to One Pound during the past year, making a total increase above the estimate of £395. The subject of increased subscriptions will require special explanation in commenting upon the Journal.

Expenditure.

7. The expenses of the year have exceeded the estimate by £340. The improvement in the receipts enabled the COUNCIL to augment the expenditure upon those branches which have contributed so largely to enhance the reputation of the Institution, and extend its sphere of utility; the excess being chiefly owing to a general increase of business, and the enlarged circulation of the Journal. The following are the principal items:—Pension of £20 granted to the senior Porter for age and length of service; Postage £24, entirely owing to the transmission of the Journal; Library £14, partially consequent upon the progress of the Topographical Department; Printing and Stationery £51, caused by increase of business, the Special General Meeting, and also by the great demand for tickets of admission to the Lectures, Museum, &c. amounting to upwards of 30,000; The Journal £190, it having become necessary to raise the numbers printed from 2,000 to 3,500, for the reasons hereafter explained; Miscellaneous £52 (no estimate was made under this head), the items being chiefly the carriage of donations of Foreign Governments, the purchase of Models, and expenses connected with the Museum.

8. The COUNCIL have the satisfaction of informing the Members that they have invested in the purchase of Stock the Life Subscriptions received during the past year, and also the sums received from Life Members in augmentation of their original Life Subscription, amounting together to £490. The funded property of the Institution is therefore £946. 11*s.* 8*d.* Three per cent. Consols.

9. In submitting the estimate of the ordinary receipts and expenditure for the year 1860, the COUNCIL find, that the resources upon which they can now rely, enable them to make a closer estimate of the necessary expenditure than they have been able to present upon recent occasions. At the same time the business of the Institution is not yet in such a state of complete arrangement as to permit them to reckon with certainty upon the expense which, if the income admits, it might be advisable to incur; alterations have yet to be completed in the Museum; and the expense of the Journal, as far as it depends upon the numbers issued, cannot yet be accurately estimated. The Institution, however, commences the year with upwards of 800 subscribers at one pound per annum, of whom 383 have increased their subscription since the 1st of January, 1860, and this enables the COUNCIL to propose the following estimate:—

10. ESTIMATE OF PROBABLE RECEIPT AND EXPENDITURE FOR 1860.

EXPENDITURE.	AMOUNT. £	s.	d.
Secretary's Salary	150	0	0
Clerk's Salary	72	0	0
Servants' Wages	350	0	0
Ditto Clothing	57	0	0
Rent, Taxes, Rates	400	0	0
Fire Insurance	29	5	0
Fuel	45	0	0
Lighting	22	0	0
Library	100	0	0
Lectures	20	0	0
Journals	500	0	0
Annual Report	50	0	0
Printing and Stationery	100	0	0
Advertisements	40	0	0
Postage	70	0	0
Artificers, Casualties, &c.	100	0	0
Repairing and Painting Building	55	0	0
Domestic Sundries	20	0	0
Miscellaneous	50	0	0
Reprint of early Journals	60	0	0
Malcolm's Pension	20	0	0
Balance	119	15	0
Total	£2430	0	0

RECEIPT.	AMOUNT. £	s.	d.
Annual Subscriptions:			
At 10*s.*	840	0	0
At £1 and upwards	960	0	0
Entrance Fees	200	0	0
Dividends	30	0	0
	£2030	0	0
Parliamentary Grant	400	0	0
	£2430	0	0
Total	£2430	0	0

11. The COUNCIL call the attention of the Members to some alterations which appear in the above estimate. The business conducted in the Secretary's office, and in the Museum, has increased to such an immense extent that the present staff are inadequate to the efficient discharge of the duty required of them. The frequent communications with the Members which have now become necessary give almost constant employment to an extra clerk, while the articles in the Museum require greater supervision than can now be afforded. The COUNCIL have therefore increased the item for wages by £50. It is necessary to repair and paint the part of the premises in Scotland Yard, the expense of which will be about £55. A sum of £60 is also estimated for reprinting the early Numbers of the Journal, which will be hereafter explained.

THE JOURNAL.

12. The anticipations which the COUNCIL entertained when they commenced the publication of the Journal have been realised to a most gratifying extent. They have succeeded in issuing an instructive professional periodical, which has received the cordial approbation of the Members. It has become a source of interest to Officers who are serving abroad, and maintains a connection between them and the Institution; it has also proved an inducement to Officers of both professions to give the Institution their support.

The COUNCIL have frequently received communications from Officers on foreign stations, expressing their high appreciation of its merits.

13. The COUNCIL had estimated that an issue of two thousand numbers would suffice, but, as soon as the character of the Journal became known, its popularity was evinced by the re-appearance of a considerable number of Members, who had not for years taken any interest in the affairs of the Institution, whose addresses were even unknown, and who now preferred their claim to the numbers of the Journal. The result is, that the copies printed have increased to 3,500, and the COUNCIL have found it necessary to reprint the early numbers to meet the unexpected demand. The Members will readily comprehend the additional business entailed upon the staff of the Institution, and the extra expense incurred in printing, postage, and clerks.

14. The COUNCIL have hitherto carried out the intention they announced in the Report of 1858, of issuing and forwarding the Journal to the Members free of charge, a system which they proposed should continue so long as the funds of the Institution might admit of it. The reasons which induced the COUNCIL to recommend that this practice should be discontinued are obvious, and were explicitly laid before the Annual Meeting last year, when they received the approbation of the Members. Earnest representations had been previously received from many zealous supporters of the Institution suggesting the permanent increase of the subscription to one pound, but, after much consideration, the COUNCIL preferred the optional course which was subsequently adopted.

15. In accordance with the general feeling which had been expressed, the COUNCIL submitted a revised List of Laws relating to the Subscription to a Special General Meeting (a Report of the Proceedings of which appears in page xxii.). The alterations proposed were deliberately adopted, the object being that no Member should be deprived of any privilege he was entitled to, previous to the publication of the Journal; but that all those who wished to receive it should, after the 1st of January, 1860, if they were Annual Subscribers, raise their Annual Subscriptions to £1, and if Life Subscribers should pay an additional sum of £3, or of 10*s.* per annum. The success of this alteration has already been most decided; 834 Annual Subscribers have up to the present time raised their subscription, while 143 Life Subscribers have either paid the increased composition, or 10*s.* subscription.

16. The COUNCIL have further to remark, that it was agreed that Subscribers of £1, while serving abroad, should receive the Journal for a reduced Annual Subscription of 10*s.* if they expressed their wish to that effect. The number in this position is not large; it is a decided advantage to the Institution to retain its Members while on foreign stations, and the supply of the Journal is the only advantage which the Institution can confer upon them during their absence.

The Charter.

17. In consequence of the feeling displayed at the last Annual Meeting in favour of procuring a Royal Charter of Incorporation, the Council made inquiries into the expense which other societies had recently incurred in accomplishing that object. They ascertained the expense of the Charter granted to the Royal Geographical Society, and they considered that it was a fair approximation to the cost which the Institution must encounter for the same purpose.

18. The Council accordingly drew up a Report upon the subject, and submitted it for the consideration of a Special General Meeting (see page xxii.), which unanimously resolved that the necessary steps should be taken to apply for a Royal Charter. A Committee was appointed to prepare a memorial to the Crown, to the prayer of which, Her Majesty has been graciously pleased to accede, and has granted a Charter to the Institution under the title of "The Royal United Service Institution." The various clauses have been framed in strict accordance with the previous existing constitution of the Society.

19. The Council regret that the expense incurred has greatly exceeded their expectations. They had instructed their legal adviser to submit a draft Charter drawn upon the precedents of the Charters of other Societies, for the consideration of the Standing Counsel of the Institution, who insisted upon alterations which were at variance with the constitution of the Society. The Council, conceiving that this difference of opinion was not likely to be removed, although considerable expense had already been incurred, directed that the original draft should be submitted to other Counsel.

20. Objections were subsequently raised by the Law Officers of the Crown to the effect that the property of the Institution could not be vested in the Members; the opinion of the Counsel appointed by the Board of Trade being, that the property must be vested in the Corporation. These differences of opinion have led to an additional outlay, which was beyond the control of the Council; the cost of the Charter amounting to £203 4*s*. 6*d*. The terms of the Charter are, however, almost identically the same as the draft originally submitted to their legal adviser.

Revision of the Laws.

21. The Incorporation of the Members necessitates a revision of the Laws, in order to bring them into harmony with the terms of the Charter. In the Report of last year the Council had recommended that the Laws should be revised for the reasons therein stated; when, however, it was decided to apply for a Charter, the Council postponed the consideration of them, with the exception of the Laws relating to the Subscription, and the first law, describing the design of the Institution; it being necessary, in the latter instance, that such description should partially appear in the preamble of the Charter. The Council submit the Laws to the Meeting in an amended

form, and, in order that the alterations may be clearly understood and comparison facilitated, the several sections of the existing and the revised Laws have been printed in parallel columns. The COUNCIL propose, that, at the close of the Annual Meeting, the Members should resolve themselves into a Special Meeting, for the purpose of taking the said Laws into consideration.

THE TOPOGRAPHICAL DEPARTMENT.

22. This Department, though recently established, is gradually assuming an important position under the superintendence of Colonel Alcock. During the progress of the war in Italy the movements of the hostile forces were, as far as information would permit, defined upon maps, with the strength of the several corps and the names of the commanders. This arrangement not only excited great interest among the Members, but it had the effect of bringing many visitors to the Institution for the purpose of examining the progress of the campaign. The Maps published by the War Department, and the Admiralty Charts, are regularly presented by Her Majesty's Government. The COUNCIL hope still further to extend this Department, and to render it of greater interest to the Members.

THE LIBRARY.

23. The COUNCIL have much pleasure in announcing that they have received from several foreign governments, in exchange for copies of the Journal of the Institution, presents of professional works, which are a valuable addition to the Library, viz.—

FROM THE NETHERLANDS . .	45 Volumes containing the course of instruction at the Royal Military Academy at Breda. 22 Plates of a Topographical and Military Map of the Netherlands.
FROM RUSSIA	3 Numbers of a Military Journal. 20 Numbers of Memoirs of the Military and Naval Topographical Depôt, St. Petersburgh.
FROM DENMARK	1 Volume of a Military, and 1 of a Naval Journal.
FROM SWEDEN	1 Volume of Publications of the Academy of Military Science for 1858, and 1 Number of ditto for 1859.

24. The COUNCIL have also to express their acknowledgments to Her Majesty's Government for the valuable work recently published by the Officers of the Scientific Corps, viz., the Journal of the Operations before Sevastopol.

THE MUSEUM.

25. Although the Museum had been to a great extent re-organised in 1858, a re-arrangement of the rooms will in the course of this year become necessary in consequence of the decision of the Special General Meeting to dispose of the collection of Natural History. The opinions of the COUNCIL

upon this subject were recorded in the Report of last year, and were subsequently confirmed by the Members (see page xxiv.). The model rooms have gradually become crowded with specimens and models of military works and *matériel*, and increased space is required to exhibit them effectually and to extend this collection.

26. The Museum has been enriched during the past year by many objects of practical utility and instruction, viz:—Models illustrating Field Works, and the attack and defence of fortified places; Mining materials, Entrenching Tools, with specimens of raw material used in military manufacture. The collection of Foreign Equipment has been increased by the appointments of a Soldier of the Belgian Line and Rifles, presented by His Majesty the King of the Belgians. The COUNCIL propose to extend still further the collections in the Naval and Military Departments during the present year.

THE LECTURES.

27. The papers which have appeared in the Journal sufficiently prove the ability of their authors, and the Council feel that it is incumbent on them to acknowledge the great advantage which the Institution has derived from the voluntary aid thus afforded. Several lectures were delivered by officers attached to government departments, whose time is much occupied, and to whom the Members are proportionably indebted.

28. The COUNCIL trust, that, in the course of the present year, they may succeed in making arrangements for commencing each Season with a Lecture, containing a complete *résumé* of the progress of Naval and Military Science during the preceding year, and of all recent inventions and improvements which have taken place in Military *matériel*.

HONORARY MEMBERS.

29. The COUNCIL have great pleasure in acquainting the Meeting that the Right Honourable Sir John Lawrence, Bart. G.C.B., to whose cool judgment and distinguished ability, while administering the government of one of the provinces of India, the country is so much indebted, has become an Honorary Member of the Institution.

VICE-PATRON.

30. The COUNCIL regret to record the death of General Sir Thomas Brisbane, Bart., G.C.B., a Vice-Patron of the Institution, and one of the original Members. Sir Thomas served with distinction in the Peninsular War, and was well known for his literary and scientific acquirements.

BEQUEST.

31. By the lamented death of Mrs. Watson, the Institution has lost a warm friend, who had for many years taken a lively interest in its prosperity and had frequently made valuable presents to the Museum. Mrs. Watson

was an Honorary Member, and has proved the estimation in which she held the Institution by bequeathing to it a legacy of £500.

The Trafalgar Model.

32. The Council avail themselves of this opportunity of expressing their thanks to the late Board of Admiralty for having at once acceded to their request by presenting to the Institution a beautifully constructed stand for the Model of the Battle of Trafalgar. The table is a massive oak structure, made of timber removed from "the Victory" when under repair.

33. The Model will not be completed at so early a period as had been anticipated, chiefly owing to its having been found desirable to entrust the execution of it to one person instead of several, as originally intended.

34. This has necessarily entailed delay, but, as the modeller selected is one of the first in his profession, the Council have a guarantee that the work will be done with that accuracy and minuteness of detail appropriate to the representation of so great a battle.

35. The period of the battle selected is that of the Victory passing under the stern of the Bucentaur, at which time the British ships were running down under sail in the appointed order.

The Arctic Relics.

36. After the return of Captain McClintock from his voyage in search of Sir John Franklin and his Comrades, the Board of Admiralty, at the request of Lady Franklin, forwarded for exhibition in the Institution the various relics of that expedition. The Council, recognising the great interest which had existed for so many years as to the fate of Sir John Franklin and his Crew, willingly appropriated a room for that purpose. For eleven weeks the public were admitted to inspect the relics, and no less than 23,600 persons during that time visited the Institution.

Volunteer Corps.

37. The national movement in favour of the formation of Volunteer Corps having received the approbation of Her Majesty and the Government, the Council, anxious to make the Institution available for all Officers connected with the profession of arms, recommend such an alteration in the Laws as will enable the Officers of Volunteer Corps, after appearing in the Gazette, to become Members of the Institution without ballot. The Council propose to insert this alteration in the Revised Laws.

38. In conclusion:—A great movement in advance has now taken place. The Charter of Incorporation alone is calculated to confer dignity upon the Institution and to confirm its stability. The substantial recognition by Her Majesty's Government of the utility and advantage of a professional Insti-

tution is a connecting link between the State and the Members. The great number of Members who have already increased their original subscriptions is a convincing proof of their approbation of the course which has been adopted. The cordial assistance received from Officers of intellectual acquirements, shows that they are anxious to impart information to their comrades, and to advance the interests of their profession by means of the Institution. The COUNCIL trust that the ROYAL UNITED SERVICE INSTITUTION, supported by the sympathy of the Officers of the United Services, may look forward to a successful career, and that, in promoting its own prosperity, it may at the same time advance the service of the country.

IV. Major-General OLDFIELD, R.E. moved—

"That the Report be adopted and printed for circulation among the Members." He must congratulate them upon the increased prosperity of the Institution during the past year; and when they considered the boon that had just been conferred upon them by Her Gracious Majesty, in granting them a Royal Charter, and the honour which they had received from the heir-apparent to the throne by becoming a Member of the Institution, they could not but expect that their prosperity would continue to increase, and that the interest already manifested in the Institution through every branch of both services would be still further extended.

Captain the Hon. A. MURRAY, R.N. said—

After the observations which had been made by General Oldfield, it would be unnecessary for him to do more than to say that he cordially concurred in every word that gallant officer had said, and he begged to second the resolution.

Lieut. GARDINER, R.N. wished to make a suggestion to the Meeting.

They had been summoned to hear the Annual Report read, and then to resolve themselves into a Special Meeting to consider the Bye-laws of the Institution. They had just got into a state of transition, from a sort of club into a corporate body, and, as he took to himself some little credit for having pressed the question of the Charter upon the Institution for several years, he thought he might be permitted to offer one or two observations. He did not wish to move an amendment upon the motion for the adoption of the Report; it was before the Meeting, and let them do as they pleased with it. But what he wished to submit was this: "That the Charter granted by Her Majesty, together with the Bye-laws proposed to be enacted under its provisions, be forthwith sent to every Member of the Institution, and that the consideration of such Bye-laws be adjourned to some future Meeting, to be summoned by the COUNCIL, as soon as convenient, specially for the purpose." He thought it was quite right, when they came to look at what the Institution had done, that every Member in the country should be made acquainted with it; and that, for this purpose, a copy of the Charter and of the proposed Bye-laws should be transmitted to them, and in the meantime the consideration of the Bye-laws should be adjourned to some future Meeting. He hoped the COUNCIL would adopt this as a sort of addenda to the Report, and then adjourn the Special Meeting to some future day, to be named at their convenience. His only object was that the Members should have time to consider the Bye-laws maturely, for, when these laws once had the common seal of the Corporation put to them, they would become very binding upon the Members. He had been advised by persons competent to give advice that there were objections in them, and that the COUNCIL would have to encounter some difficulties if they were not careful. He was told that these Bye-laws had not been submitted to Counsel for approval. In the Charter it was stipulated that the Bye-laws must not be repugnant to the laws of the realm; therefore, they must be cautious to see that this was complied with. As the originator of the movement for getting the Charter, he took the liberty of making this suggestion.

Colonel The Hon. J. LINDSAY, M.P. said—

Perhaps he had better state the course which the COUNCIL had settled to pursue. One part of Lieut. Gardiner's remarks went to this, that a copy of the Charter should be forwarded to every Member of the Institution. That could not be done before they had the Charter. The Charter was only dated the 22nd of February, and the COUNCIL had already settled to send the Charter to every Member. The proposition of the COUNCIL was, that at the close of the Annual General Meeting they should resolve themselves into a Special Meeting for the purpose of entering into the consideration of the Bye-laws. Then, he apprehended, would be the time for Lieut. Gardiner to move any amendment with regard to the Bye-laws that might seem to him desirable.

The CHAIRMAN said—

It did not appear to him, so far as he could judge from the Rules, that this could be called an amendment upon the resolution before the Meeting; nor did he understand Lieut. Gardiner to move it in that shape. It would come more suitably when the Meeting had resolved itself into a Special Meeting to consider the Bye-laws. Then, it would be competent for Lieut. Gardiner to move, as they said in the House of Commons, that the Chairman do leave the chair, or that the Meeting be adjourned. But at the present moment he thought it would be more consonant to the feelings of the Meeting, that he should put the Motion, "That the Report be received and adopted, and printed for circulation among the Members."

The Resolution was put to the Meeting and carried.

V. The names of Eight Members retiring from the COUNCIL by rotation were read:—

W. STIRLING LACON, Esq.	Major-General MATHESON.
Rev. Mr. GLEIG.	Captain NOLLOTH, R.N.
Captain TUPPER.	Lieut.-Col. HOGG.
Commander HOWES, R.N.	Captain GRANT.

VI. Colonel J. C. KENNEDY, C.B. said—

The Resolution which he had the honour to move was one which upon this occasion could not be called one of mere form. It was, "That the thanks of the Meeting be given to the Members of the COUNCIL, who retire by rotation." He was sure he was expressing the feeling of the Meeting when he said they were deeply indebted to the COUNCIL for their labours during the past year. The COUNCIL had not passed through an ordinary year of work. Many of the gentlemen had been employed from morning to night—indeed, he might say, had given up their time for the advantage of the Institution. The year had been marked, not only by the grant of the Royal Charter, but also by the enrolment among them of the Prince of Wales as one of their members. It would also be memorable in the annals of the Institution, he hoped, as a year which would lead to a very large increase of their members, by the admission of those fellow-subjects of theirs, whom, in the name of the Army and the Navy, he might almost call their comrades, in the Volunteers. These were some of the outward labours of the Institution; but there were others, which those who had read the Journal of the Institution knew were of greater importance, viz. the pains which had been bestowed upon the preparation of the papers that had been read in that room, and afterwards published and distributed among the members. There was also another subject upon which he thought they might congratulate themselves; through the care and trouble which the COUNCIL had bestowed upon the performance of their duties, they were in advance of the British Museum, for they had got rid of their beasts and birds, which everybody must be fully aware, if not incompatible with, were certainly an incumbrance to, their Museum. It had now become more professional than it had hitherto been.

The gallant Colonel then moved his Resolution, and in addition proposed,

"That the following Members be the COUNCIL for the year 1860–61:

Colonel ADAIR.	JOHN BARROW, Esq.	
Captain FOWKE, R.E.	Major-Gen. WATKINS.	
Lieut.-Colonel STUART.	Captain TYLER, R.E.	
Captain COLLINSON, R.N.	Major JERVOISE, R.E.	
Captain PACKE.	W. STIRLING LACON, Esq.	For Re-election.
Captain FISHBOURNE, R.N.	Captain TUPPER.	For Re-election.
Captain JEFFERSON.	Captain NOLLOTH, R.N.	For Re-election.
Sir SIBBALD SCOTT, Bart.	Captain Sir FRED. NICHOLSON, Bart. R.N.	
Lieut.-Colonel READ.	Lieut.-Colonel LANE FOX.	
Rear-Admiral ELLIOT.	Captain MACQUEEN.	
Lieut.-Colonel KEPPEL.	Lieut.-Colonel LE COUTEUR.	
Captain Sir W. WISEMAN, Bart. R.N.	Captain ASTLEY COOPER KEY, R.N."	

The Resolution, having been seconded by Captain GEORGE ST. VINCENT KING, R.N., C.B., was put and carried unanimously.

VII. Vice-Admiral Sir GEORGE TYLER, K.C.B., begged to propose—

"That the thanks of this meeting be given to the Auditors for their valuable services, and that the following gentlemen be elected for the ensuing year:—

JOHN CASE, Esq. THOMAS SMITH, Esq.
HENRY ELLIOT, Esq. Captain DOLBY."

He was sure he need not say anything to induce the Meeting to thank these gentlemen, who had used their best endeavours to keep their treasury in order. Looking at the elaborate Report which had been read, he was quite satisfied that they had given a great deal of time and attention to their duties.

Colonel DUNNE, M.P. begged to second the proposition.

He thought the state of the funds was a subject for congratulation. Thirty years ago, when he first joined the Institution, the annual subscriptions were about £600 a year; now they were more than £2,000; and he thought that they were in the way of getting much more. The economy shown by the COUNCIL ought to be a pattern to public institutions. He congratulated the Meeting upon the encouragement which the Government had at last given to the Institution. For many years it had been slumbering. There was no institution that could do so much for the benefit of the services. The moment he heard of it, he joined it, and for many years he had to lament the apathy which prevailed in the services with reference to it. It was for a long period disgraceful to compare the state of education in the service with that of the army of France and of other countries. But he believed that, in this respect, we could now compete with continental nations. He might also congratulate them that the Institution directed attention to practical education. The Government had introduced measures for raising the standard of education in the Army, but he did not think they were so practical as their own. It would be well to show their opinion to Government, that the professional attainments required in our officers should be those which would be serviceable in the profession, and not those which would be useless.

The Resolution was put to the Meeting and carried unanimously.

The CHAIRMAN announced that the business of the Anniversary Meeting was concluded.

(Signed) DE GREY AND RIPON,
Chairman.

B. BURGESS, CAPTAIN,
Secretary.

Lieutenant-General the Hon. Sir E. CUST, K.C.B. moved—

"That Admiral Sir GEORGE BACK do take the Chair."

The Proposition could not require one word from him to make it acceptable to the Meeting. But since he had the opportunity he was desirous of making one observation. He was not aware whether they all knew the extent and value of the Library, but he was anxious to call attention to it, because he thought their thanks were due to the COUNCIL for the extreme liberality with which they placed it at the disposal of those who had occasion to refer to it. It was of extreme value to all who took any interest in military literature, not only from the richness of its contents, but also from the liberal arrangements by which officers were enabled to consult every variety of work upon professional topics. It was of the greater value, because anybody who had experience of the Library at the British Museum knew that it was quite impossible to obtain the same facilities there, which were available in the Library of this Institution.

Major-General STANHOPE seconded the Motion.

Admiral Sir GEORGE BACK accordingly took the Chair.

General Sir WILLIAM GOMM, G.C.B. moved,—

"That the thanks of the Meeting be given to the Earl de Grey and Ripon, for having taken the Chair at the General Meeting, and for the urbanity and kindness with which he had filled it."

Capt. FISHBOURNE, R.N., C.B. had great pleasure in seconding the Resolution.

The CHAIRMAN, in putting the Motion to the Meeting, said,—

He need scarcely observe, that, when the object of the Institution was considered, by no one could the Chair be more appropriately and ably filled than by the noble Under-Secretary of State for War.

The Resolution was put to the Meeting and carried with acclamation.

EARL DE GREY and RIPON—

Sir GEORGE BACK and GENTLEMEN,—I am extremely grateful to you for the kind manner in which you have just passed this vote of thanks. I can assure you that it has been a great gratification to me to be able to be present here to-day. I felt much flattered when my friend Colonel Lindsay first proposed to me that I should take the Chair on this most interesting occasion. For, Gentlemen, although I am afraid I have long been a very unworthy member of this Institution, it does so happen that I am rather an old one. It is now a good many years since, having become an officer in a yeomanry corps in my own county, I joined this Institution. It is, therefore, peculiarly gratifying to me, that, owing to the official situation which I have the honour to fill, you should have thought fit to ask me to preside here to-day. I assure you I entertain the very highest appreciation of the value of the services rendered by this Institution, and which have been rendered by it, especially of late years, to the United Services of the Army and Navy. Gentlemen, we live in times when we see throughout the continent of Europe vast armies in all the greater States. It is, therefore, not surprising that in this country also, our attention should have been directed much more of late years than in past times to all that concerns the defences of the country, and to our naval and military condition. It is not possible, Gentlemen, either from the material circumstances of this country or from our constitutional system, for us to attempt to vie with the great military monarchies of the continent in respect to the numbers of our Army. But, if that be so, it is especially important that the military and naval forces of this country should be raised to the highest possible state of efficiency. I speak more particularly at the present moment of our military forces, because our Navy is of course without a rival in the world. But our military forces are, as I have said, numerically smaller than those of other countries, and unable to vie with them

in that respect. We have been accustomed to count chiefly upon the courage, the zeal, and the devotion of the English soldier; and those will never fail us. But it is also needful now that we should take every means to extend scientific knowledge throughout the Army; and as a scientific profession, for such it ought to be, to raise it to the highest possible state of efficiency. There are peculiar circumstances in these days, if I may be permitted to say so, which render this of especial importance. We live in times when science is becoming of greater value. I trust you will pardon me if I am trespassing at all upon professional ground, upon which, of course, it would be presumptuous for me to enter, except with reference to those general topics that any one who has thought upon the subject may treat of. I say that in these days scientific attainments are peculiarly important in the officers of any army, because of the great changes which are being made in armaments, in regard to both artillery and small arms. Those changes, keeping pace as they do, and as I trust they will, with the great scientific and manufacturing discoveries of later days, are making the Army in every department more and more strictly a scientific profession. Consequently, it is of the greatest importance that every means should be afforded, and that every encouragement should be given, to the officers of the Army to pursue military studies upon a scientific basis. Now, *that* I take to be the object of this Institution; and I take it, that it is becoming increasingly your object from day to day. And now, when you are about to enter, as it were, upon a new phase of your existence,—when you have received, as on this day, a signal proof of Her Majesty's approval of your efforts, it is most fortunate that those efforts should be directed in a channel, which I believe to be the one by which it will be in your power to confer the greatest benefits upon both services. For although it is not unnatural, connected as I am at the present moment with the military profession—not by being a military man myself but by my official position—that I should speak somewhat more of the Army than of the Navy upon this occasion, yet no one has ever doubted that the Navy is pre-eminently a scientific profession; consequently, such means of study as this Institution affords, must be equally useful in the case of the Navy as in that of the Army. You will perhaps permit me, in this assembly of officers of so much distinction, to express to you how high an honour I feel it that I should be connected officially with that great body, the English Army. That is a profession with which any man may well be proud to have even a temporary connection. The English Army has covered itself with glory wherever it has been employed; and I am confident that in these days, when armies are more numerous, when war becomes more scientific, if it ever should be our misfortune to be engaged in war again, the English Army of the future will be found fully equal to that of the past. Gentlemen, I rejoice to find that you are about to open your doors to a new class of Members—I mean the officers of the Volunteer Corps. It is not unnatural that I should allude to that subject, because I have been very much connected with the organisation of that force of late. Now I do not for a moment suppose that the Volunteer Force, whatever may be its number or efficiency, can in any degree take the place of the regular Army. It is not intended in the slightest degree as a substitute for that Army, or for any portion of that Army. But I do believe that, if the time of emergency and external danger should ever arise, the Volunteer Force would be a great assistance to the regular Army, and that, if the members of that force continue to act in the spirit which has hitherto animated them, they would be able, under such circumstances, to render great services to their country. I am sure a better thing could not be done than that, through the medium of this Institution, the officers of the British Army should hold out to the Volunteers the hand of fellowship. The more nearly they can copy your example the better; the more closely you can show them that you sympathise with their efforts, that you are inclined to treat them as your comrades, and not to separate them from you by any feeling of jealousy, or by any notion that they form a body that could for a moment be in rivalry with your own, the more will you add to their efficiency, the more will you be acting in the spirit which has animated Her Majesty in permitting the organisation of that force, and which has induced the illustrious Duke at the head of the Army to connect himself also with the Volunteer Corps. Gentlemen, I must not detain you from other business which calls for your attention; neither, I am sorry to say, can I remain any longer myself on account of official duties which call me away; I will therefore only conclude by thanking you, as I do most heartily and sincerely, for the kind manner in which you have received me on this occasion, and which I assure you has been a source of gratification to me.

PROCEEDINGS

AT A

SPECIAL GENERAL MEETING.

Rear-Admiral SIR G. BACK in the Chair.

The Annual Meeting having, on the motion of Colonel LINDSAY, seconded by Mr. STIRLING LACON, resolved itself "special," for the purpose of considering the Bye-laws, as framed anew in conformity with the Charter,

The CHAIRMAN said—

Before entering upon the business of the Special Meeting, he would briefly remark, that no efforts had been spared by the CHAIRMAN, COUNCIL, and others, to bring the laws of the Institution in conformity with the Charter, and to advance as much as possible the practical utility of the ROYAL UNITED SERVICE INSTITUTION.

I.—The Notice by which this Special Meeting was convened was read—

Lieutenant GARDINER said—

Feeling as he did that the Institution, years ago, ought to have been incorporated, and having been instrumental last year in inducing the COUNCIL to get the Charter, he took some interest in its welfare. It was utterly impossible to alter the Bye-laws without some consideration; and he would propose that, instead of going into the subject now, a copy of the Charter, together with the Bye-laws proposed to be enacted under its provisions, should be sent forthwith to every Member of the Institution, and that the consideration of the Bye-laws be adjourned to a future meeting, to be convened by the COUNCIL, as soon as convenient, specially for that purpose. There were many points in them which struck him as being repugnant to the laws of the realm. He recommended that they should first lay them before Counsel, with instructions to draw them in such a way as to steer clear of any rock which they might otherwise split upon.

W. BRYAN COOK, Esq., late 85th Foot, seconded the Motion.

Colonel LINDSAY said—

He felt bound to oppose the Motion, as perfectly useless and unnecessary. In the first place, the laws were made according to the pre-existing constitution of the Society. The terms of them were slightly altered, either to adapt them to the Charter, or for the purpose of making them plainer. He could not see any object to be gained by an adjournment. When the circulars were sent out, announcing the annual meeting, notice was given that the meeting would resolve itself into a Special Meeting, for the purpose of considering the Bye-laws; therefore, if any gentleman residing at a distance had wished to come up and take part in the meeting, he had full opportunity for doing so. The COUNCIL had complied with every regulation in the existing laws. The proposed Bye-laws had been hung up in the Reading-room, so that Members who frequented the Institution could read them and remark upon them, and if they so pleased make

any amendments which were not contrary to the fundamental principles of the Society. Having done so much as this, he thought it would be useless for the Meeting to adjourn; moreover, he might add, that, during the time the Charter was under consideration, these laws were submitted to the legal adviser, though not to the standing counsel. Having explained the course taken by the COUNCIL, he must conclude by asking the Meeting to negative the Motion which the gallant gentleman had put. Duly summoned under the existing laws, under the regulations in force, they were as fully competent to enter into the consideration of the Bye-laws as any Meeting that might be assembled a fortnight or three weeks hence.

Colonel SYKES said—

If the Members present had had the opportunity of comparing the variations between the former and the proposed Bye-laws, and if they were satisfied that they were competent to pronounce an opinion upon the propriety of those variations, then it was entirely in the hands of the Meeting to decide; and there was no necessity for another Meeting to consider that upon which they had already made up their minds. But if the Members had not had an opportunity of forming a judgment, that was a very different matter. It was for the Meeting to judge whether they were in that state of competency or not. If the Bye-laws had been hung up in the Library—(a voice: Fourteen days)—it had been in the power of every Member to come and see what had been proposed by the COUNCIL. If they had not done so, it was their own lâcheté, and not that of the COUNCIL. The Charter had not been sent out to the Members at large, because it had only just been obtained. The Bye-laws could not be sent out to the Members at large, because they had not yet been determined upon. They were brought before the Meeting for the first time. Lieut. Gardiner, therefore, had reason on his side if the Members were not in a position to pronounce an opinion upon the proposed changes: otherwise, he did not see what necessity there was for delaying the decision.

Colonel BURLTON would make a brief remark or two in reply to the gallant officer—

He stated that the Bye-laws had been suspended in the Library. No intimation to that effect had been sent to him; nor was he aware that any Member of the Institution, except the COUNCIL, was aware that they were laid out for inspection there. Until he came into the room that morning he had not the slightest idea of the nature of the proposed alterations. He had had no time to look over them since, and, therefore, he was not competent to pronounce an opinion upon them.

Colonel DUNNE asked—

If it was likely they would get a larger Meeting by delaying the consideration of the question for a fortnight? He did not suppose that a single gentleman now absent would come up to attend an adjourned Meeting. He put the fullest confidence in the COUNCIL that they had done what was best for the Society. They had taken legal advice, and he had that confidence in them that he should vote for the adoption of the Bye-laws as presented to them. And he did not think the delay of a fortnight would give any man a better means of forming an opinion.

Lieut. GARDINER observed—

That the Charter was dated the 22nd of February; consequently the Bye-laws could not have been hung up in the Library fourteen days from that date. He considered this fatal, and that a fresh notice must be given before the Bye-laws could be brought up.*

* A Copy of the Charter as granted, before being actually sealed, from which the laws were framed, was in possession of the COUNCIL upwards of fourteen days previous to the Special Meeting.—ED.

The CHAIRMAN said—

The COUNCIL had informed the Members of the Institution in the best way they could. With respect to Lieut. Gardiner's objection about the insufficiency of the notice, it was true you could not make fourteen days out of a less number. But according to the old laws, Section XII., "should it be proposed to make or repeal a fundamental law, the proposition to such effect, signed by the proposer and seconder, shall be suspended for fourteen days in the Library." The Secretary was not to announce to everybody that there was a new law suspended there, it was only provided that it was to be hung in the Library. This had been done. Colonel Lindsay and Colonel Sykes had explained what the COUNCIL had done; therefore he had nothing more to do than to put the motion for an adjournment.

The motion was then put, and negatived by a large majority.

Lieut. GARDINER said—

That the names of the proposer and seconder were not attached to the proposed Bye-laws.

Colonel LINDSAY replied—

That the signatures of five Members of COUNCIL were attached to the proposed alterations in the Bye-laws which were suspended in the Library.

II.—The SECRETARY produced and exhibited the original document, as suspended in the Library; and, at the request of the Chairman, then read the several sections of the amended Bye-laws.

The CHAIRMAN asked—

If it was the pleasure of the Meeting that these should be received as the Laws of the Institution.

Lieutenant GARDINER said—

He had one or two objections to make. In the second section, "Composition," he would leave out the words "by ballot" in the second paragraph. He thought it was rather an invidious thing that these gentlemen should be balloted for in the Institution, especially when the class mentioned in the first paragraph were not elected by ballot. Then in the third section, "Government," he thought this part might be left out: "The COUNCIL shall submit to the Annual General Meeting a list of names from which the vacancies may be filled." He thought it should be left to the opinion of the General Meeting, without the COUNCIL recommending who should fill the vacancies. It was a course not generally adopted in other institutions. Then he came to the fourth section, "Subscription." There, he ventured to say, that unless they were very careful they would get into some difficulty. It was a question, so he was informed, whether they had the power to make a prospective law to compel Members who had subscribed for years, and whose funds had been appropriated to the enlargement of the Institution, to give an increased subscription, in order to be furnished with the Proceedings of the Institution. It was not fair to these gentlemen, who had been in the habit of paying 10*s.* a-year, and whose funds had upheld the Institution when it was in a state of insolvency nearly, that they should be called upon to pay an increased £3, and an additional subscription of 10*s.*, or else be curtailed of privileges that would be given to those who came in later (cries of "No, no.") He thought the section altogether, especially that part of it, objectionable. They ought not to make it compulsory, or say "You shall not have that which the Corporation produces." Therefore, on all these grounds, he thought it would be better to bring that clause back to its original condition. Then he thought the latter part of clause 4 objectionable, and that it should be left out; for if an officer was going abroad he ought not to be called upon to notify it to the Secretary; inasmuch as it would be known officially that he was going abroad.

Captain FISHBOURNE said—

There was a certain point in Lieutenant Gardiner's objection. The only way was to look at it from a practical point of view. The COUNCIL had hitherto given to every Member a copy of the Journal; but they found from the expense that they could do this no longer. Now, Mr. Gardiner wanted the COUNCIL to do that which they could not do, because they had not the funds to do it. He complained that the COUNCIL were appropriating the money of the Members. Now, this was what they wanted to avoid. They found they could not give copies of the Journal to every Member. Therefore, the only thing they could do was to give it to those who would pay for it. Mr. Gardiner complained of money being taken out of other people's pockets, and yet he asked to be furnished with the Journal at the expense of other people. Granting that this proposition was carried, then, as a necessary consequence, as they had no funds to print the Journal and furnish every Member with a copy, they must come to the resolution to have *no* Journal at all. They knew very well that the effect of the Journal had been immense; it had given an impulse to the Institution which it seemed Lieutenant Gardiner wished to stop; he wanted the Institution to fall back to the original position from which it had been raised.

Lieutenant GARDINER said—

He was not to be carried away by these plausible observations. He did not mean anything of the kind that Captain Fishbourne attributed to him. If the Journal was so valuable, let it be sold to the Members, and then they would get rid of the difficulty.

Colonel LINDSAY said—

There was one point that ought to be brought under the notice of the Meeting. When the COUNCIL brought out the Journal, they stated in the Annual Report at the time, and also in the next Annual Report, that they intended to give the Journal to all the Members of the Institution, *only so long as the funds would enable them to do so.* (Hear, hear.) The whole question, from first to last, turned on *that.* The COUNCIL never provided that they would continue to print and issue the Journal free of expense, and send it abroad to all stations free of charge, unless they found they could afford to do so. They found, as stated in the Report this year, that no less than 3,000 Members wanted the Journal. In the first instance, the COUNCIL calculated that not more than 2,000 at the very utmost would be required; in fact, not 1,500, for he was sorry to say that at that time there were not 1,500, or even 1,000 Members who took an interest in the Institution. They calculated upon 1,500 being required, and they printed 2,000 in order to have 500 copies in hand. Gradually, the Members found the Journal so valuable, that they very soon came to the Institution and asked for it, and the COUNCIL had to print an additional 1,500 copies in order to meet the demand. They had adhered religiously to their engagement up to this time; they had sent the Journal to all parts of the world, but last year they were only enabled to do so at the expense of other departments of the Institution. They therefore appealed to the Members upon the basis they started with two years and a half ago, when the Journal first appeared, and Members had responded to the call. They submitted the case last year to the Members, and the Members approved of the course they proposed to pursue—that in order to be entitled to the Journal they should pay an increased subscription. Those Members who did not wish to pay the increased subscription would have all that they had before the COUNCIL commenced the publication of the Journal. He was happy to add that there was not much danger of there not being a sufficient number of Members to pay for the whole expense of the Journal, including the Members who might be serving abroad, and who would only pay the reduced subscription. For it was announced in the Report that 834 annual subscribers had, up to the time the Report was printed, raised their subscriptions, and since then there had been an addition of something like forty more; and three days ago an additional forty had been added to the subscription list of officers connected with the Guards. The result was, there were about 920 subscribers of £1 each, in addition to 143 life sub-

scribers, who had increased their composition by £3. They had, consequently, about 1,100 Members who had increased their subscriptions, and he did not hesitate to say that the number would be increased to 1,200. They should therefore have ample funds to pay the full expenses of the Journal without causing 6*d*. expense to those who did not wish to join in taking it.

Captain SWENY, R.N.—

Expressed his regret that Lieutenant Gardiner was a person with whom he unfortunately invariably differed in opinion. He submitted to the Meeting whether anything could be more liberal, than that, for the trifling subscription of ten shillings, the Journal, which it was generally admitted was a most valuable production, should be sent to Members at a distance; therefore no one could complain that officers on duty abroad did not receive some benefit for their subscription. He thought they were deeply indebted to the COUNCIL for their exertions in improving this valuable and important Institution. So far from it being in the desponding state he remembered it five years ago, they had restored the confidence of the public and of British officers to such an extent, that they were now coming in, in large numbers, upon the increased subscription.

Captain SWENY concluded his speech by an elaborate statement of the expenses connected with the Journal.

Lieut. GARDINER said,—

He would propose that all Life Subscriptions should be invested in the public funds in the name of the corporation.

Colonel LINDSAY observed,—

That it was already in the Charter, that all Life Subscriptions should be vested in eligible securities.

Lieut. GARDINER said,—

He would come to that section presently. He had no further observation to make upon the fourth.

Major BOILEAU said,—

Every one present must be desirous to make the Bye-laws as valuable as possible, and that was the only excuse he had to offer for trespassing upon their attention. The suggestion he had to make was with reference to Section III, "Government." It was there stated, that the COUNCIL should submit to the Annual General Meeting a list of names from which the vacancies may be filled. Now, observe the practical operation of that. Out of the eight members who went out by rotation, five would not be eligible for re-election; consequently, there must be five different persons to fill the places of those five. Now, "the COUNCIL," it said, "shall submit to the Annual Meeting a list of names from which the vacancies may be filled." It would appear that the filling up of those vacancies was to be limited to the list of names submitted by the COUNCIL. The present COUNCIL would believe that he did not wish to throw any imputation upon their perfect fairness, but these rules would be in force long after the present COUNCIL was taken from this world: therefore, it was desirable to consider what would be the practical working of that rule hereafter. It might be that at some future time the COUNCIL would only submit five names, and the consequence would be that the General Meeting would have no option but to take the names thus recommended by the COUNCIL. Now, he did not think *that* a proper position for the Institution to be placed in. He therefore submitted to the consideration of the COUNCIL, whether it would not be desirable, instead of saying the COUNCIL shall submit a list of names, to state that there should be a certain number of names submitted, say ten, so that the clause should read, "The COUNCIL shall submit to the Annual General

Meeting a list of not less than ten names from which the vacancies may be filled." Such a provision would allow of a little choice to the Meeting, instead of limiting them to five names only. If ten was not the right number, he would suggest any other number.

The Amendment, after being seconded by Captain WHEATLEY, R.N., and after some remarks from Mr. LACON, Colonel LINDSAY, and Captain FISHBOURNE, was put from the Chair and carried.

The CHAIRMAN asked,—

If any other gentleman wished to offer any remark upon the Bye-laws.

Lieut. GARDINER said,—

He wished to make a remark about the "Funds," Section V. It said "that the Funds of the Institution and all Life Subscriptions and Legacies shall be invested in eligible securities in the names of Trustees selected by the COUNCIL." He would propose to leave out "eligible securities," and substitute "government securities." And in the room of "in the names of Trustees," substitute "in the name of the CORPORATION." He had seen cases, where, in the event of a Trustee dying, parties were put to a considerable expense in supplying another trustee. If the funds were invested in the name of the corporation, no difficulty of the kind could occur, because the corporation never died.

Mr. LACON explained,—

That the section in question had been drawn up in conformity with the Charter, into which the clause relating to Trustees had been inserted at the express direction of the law officers of the Crown.

The Amendment, not being seconded, fell to the ground.

The remaining sections having been gone through without objection,

Mr. LACON, seconded by Major BOILEAU, proposed,—

In Section III. paragraph 9, that the words "and the said appointments shall be considered as being held only from year to year," be struck out.

Which was agreed to.

The CHAIRMAN then put the question,—

"That the Bye-Laws, as amended, be the Bye-Laws of this Institution."

Carried *nem. con.*

The CHAIRMAN announced that the business of the Meeting was concluded.

(Signed) G. BACK, REAR-ADMIRAL,
Chairman.

B. BURGESS, CAPTAIN,
Secretary.

III.—It was proposed by Captain PACKE, seconded by Lieut.-Colonel ALCOCK, and carried unanimously, that

"The thanks of this Meeting be given to Admiral Sir G. BACK for his kindness in taking the Chair on this occasion."

APPENDIX.

PROCEEDINGS AT A SPECIAL GENERAL MEETING.

At a Special General Meeting of the Members of the UNITED SERVICE INSTITUTION, held in the Theatre of the Institution, at Two o'clock, P.M., on Saturday, the 16th April, 1859,

His Grace the DUKE of NORFOLK, Vice-Patron, in the Chair.

I. The Notice by which this Special General Meeting was convened was read.

II. The Report of the COUNCIL on the subject of applying for a Charter was read, as follows :—

The COUNCIL have had under their consideration the propriety of presenting a humble Petition to Her Majesty, praying her to grant to the Members of the United Service Institution "A Royal Charter of Incorporation."

Being deeply impressed with the rising and important position which the Institution is assuming, and believing that the incorporation of the Society will give it permanence and stability, and add materially to its efficiency, the Council decide to call a Special General Meeting of the Members for the purpose of taking into consideration this subject, and such other matters as may be brought before it, due notice to be given according to the provisions of Section XI. of the Laws.

The COUNCIL desire to submit the following reasons for the consideration of the Members.

1st. That the possession of a Royal Charter would place the Institution in a higher position among scientific societies, and would tend to raise its character in public estimation, and ensure its permanence.

2nd. That the legal enrolment of the Institution as a corporation would enable it to raise or defend an action in its own name, and do away with the individual responsibility of its Members.

3rd. That the costs which are now repeatedly incurred by the Institution in the alteration of the trust deed, owing to changes in the names of the Trustees, &c. would be avoided.

4th. That under the provisions of a Charter the Institution would be able to receive and hold property of any description in its own name, whereas at present, legacies made to the Institution might be rendered void by reason of inaccuracies in the form of the bequest, or by the omission to place such property in trust, mistakes in the names of the trustees, &c.

PROBABLE COST.

The COUNCIL have ascertained that the cost of obtaining a Charter by the Royal Geographical Society was £151; and that incurred by the Royal Naval Benevolent Society was—

	£	s.	d.
For fees	100	0	0
Lawyer's charges . . .	27	2	2
	£127	2	2

The COUNCIL are of opinion that these two instances will suffice to give a fair approximation to the cost which would be incurred by the Institution.

Signed, JAMES LINDSAY, Colonel,
Chairman of the Council.

UNITED SERVICE INSTITUTION,
28th March, 1859.

III. It was moved by Colonel LINDSAY, and seconded by Colonel YORKE—

That this Meeting do adopt the recommendation of the COUNCIL, and empower them to take the necessary steps to obtain a Charter of Incorporation.

Carried *nem. con.*

REVISION OF THE LAWS.

IV. The Report of the COUNCIL upon the Revision of the Laws was read.

1st. In the Annual Report of this year the Council drew the attention of the Members to the necessity which, in their opinion, existed for a revision of the Laws; and in paragraph 33 they recommended that the question should be brought under the consideration of a Special General Meeting during the present season.

2nd. The principal alterations which the Council recommended are contained in the First and Sixth Sections.

In the first Law the description of the design is feeble, and does not adequately represent the character and object of the Institution. The COUNCIL propose to remedy this defect by making the intellectual and scientific development of the design more prominent, and by giving a fuller description of the means by which they seek to promote Naval and Military Art, Science, and Literature. They also propose to omit the words "Natural History," respecting the collection of which the opinions of the COUNCIL have been given (in page 8 of the Annual Report).

With regard to the revision of those Laws which regulate the Subscriptions (Section VI.), the COUNCIL have stated at length, in the Annual Report (pages 6 and 7), their reasons for the alterations they recommend.

As many of the other Sections of the Laws require amendment, in consequence of some of the provisions having become obsolete, and it being necessary to adapt others to the present circumstances of the Institution, the COUNCIL submit the Laws to the Meeting in an amended form, and, in order that the alterations may be more clearly understood, and comparison facilitated, the several Sections both of the Existing and the Revised Laws have been printed in a relative position to each other.

(Signed) JAMES LINDSAY, Colonel,
Chairman of the Council.

Colonel Lindsay announced that, it being decided to apply for a Charter, the COUNCIL only proposed to press the revision of the first Section, relating to the design, and of the Sixth Section, affecting the subscriptions, and to postpone the consideration of the remaining Laws until after the decision of the Crown upon the application be known.

V. The present design of the Institution, as contained in Section I. of the Laws, and the proposed alterations were then read.

PRESENT LAWS.	REVISED LAWS.
SECTION I.—DESIGN.	SECTION I.—DESIGN.
1. The United Service Institution is founded as a Central Repository for objects of Professional Art, Science, and Natural History, and for Books and Documents relating to those Studies, or of general information. The delivery of Lectures on appropriate subjects is included in the design of the Institution.	1. The promotion of Naval and Military Art, Science, and Literature, is the object of the United Service Institution (originally called the Naval and Military Museum). 2. The principal means by which this object is sought to be attained are,—the formation of a Library containing Historical, Scientific, and Professional Works, Maps, Charts, and Plans; the delivery of Lectures; the exhibition of Inventions; and the publication of a Journal; a collection of Arms of all Nations; and a Museum, which shall serve as a Central Repository for objects of Professional Information, and for Trophies and Relics, &c., connected with distinguished Officers, and Naval and Military operations.

VI. It was moved by Captain FISHBOURNE, R.N., and seconded by Captain GRANT—

That this Meeting do adopt Section I. of the revised Laws as now read.

It was proposed by Lieut. GARDINER, R.N., and seconded by Major RHODES—

That this meeting do adjourn till after the Charter be obtained.

This amendment was put from the Chair, and lost, and the original Resolution carried.

VII. It was moved by Lieut.-Colonel ALCOCK, and seconded by Lieut.-Colonel READ—

That this Meeting, having sanctioned the revision of Section I. of the Laws, do authorise the COUNCIL to dispose of the Zoological and Botanical Specimens in the Museum in such manner as will most benefit the interest of the Institution.

After some remarks from Sir RAYMOND JARVIS, the Resolution was put from the Chair and carried.

VIII. Section VI. of the Existing Laws, and Section IV. of the Revised Laws, were then read.

PRESENT LAWS.	REVISED LAWS.
SECTION VI.—SUBSCRIPTIONS.	SECTION IV.—SUBSCRIPTIONS.
1. An Entrance Fee of One Pound shall be paid by all Members on joining the Institution.	1. An Entrance Fee of One Pound shall be paid by all Members on joining the Institution.
2. The Annual Subscription shall be not less than Ten Shillings, due on the 1st of January.	2. Annual Subscriptions shall be due on the 1st of January in each year; Subscribers of not less than One Pound a year, shall, after the 1st of January, 1860, be entitled to receive the Numbers of the Journal commencing in the year in which they become Members.
3. The payment of the sum of not less than Six Pounds, in addition to the Entrance Fee, shall constitute a Member for Life.	3. Annual Subscribers of Ten Shillings, shall, after the 1st of January, 1860, receive, as heretofore, the Annual Report, but not the Numbers of the Journal.
4. Any Member failing to pay his Annual Subscription for two successive years shall cease to be a Member, unless the Council should see reason to decide otherwise.	4. After the 1st of January, 1860, all Subscribers of One Pound a year shall, while serving on Foreign Stations, have their Subscriptions reduced to Ten Shillings a year, commencing on the 1st of January succeeding their embarkation, if they express their wish to that effect in writing to the Secretary.
5. Members withdrawing from the Institution re-admissible only on payment of arrears, unless the Council should see see reason to decide otherwise.	5. Life Subscriptions. After the 1st of January, 1860, the payment of a sum of Nine Pounds in addition to the Entrance Fee shall constitute a Member for Life, who shall be entitled to receive the Numbers of the Journal commencing in the year in which he becomes a Member.
	6. Life Subscribers of Six Pounds in addition to the Entrance Fee shall receive as heretofore the Annual Report, but not the Numbers of the Journal.

7. Annual Subscribers of Ten Shillings, and Life Subscribers of Six Pounds, while serving abroad, shall be entitled during such service to receive the Current Numbers of the Journal, on notifying their wish to that effect to the Secretary in writing.

8. Members who join the Institution on or after the 1st of October in any year shall not be charged the next Annual Subscription on the 1st of January.

9. Members failing to pay their Annual Subscription shall be liable to have their Names removed from the List of Members at the discretion of the Council.

10. Members withdrawing from the Institution, or whose names have been struck off for non-payment of their Subscriptions after repeated applications, shall be re-admissible only on payment of arrears from the date of last payment.

IX. It was moved by Captain PACKE, and seconded by Major WHITE—

That this Meeting do adopt Section IV. of the Revised Laws as now read.

It was moved by Lieutenant GARDINER, R.N. and seconded by Captain YONGE, Royal Artillery—

That this question be adjourned till after the obtaining of the Charter.

After some remarks from Sir SIBBALD SCOTT, Captain PACKE, Colonel LINDSAY, Captain FISHBOURNE, R.N., and Major RHODES, the Amendment was put from the Chair and lost.

It was moved by Major RHODES, and seconded by Lieutenant GARDINER, R.N.—

That the Subscription List should be so altered that Subalterns should pay Five Shillings, Captains Ten Shillings, Field Officers One Pound, and General Officers One Pound Ten Shillings, each to receive a Copy of the Journal whether at home or abroad, and that the corresponding Ranks in the Navy should pay in the same way.

After some Remarks from Captain FISHBOURNE, R.N., and Lieutenant GARDINER, R.N., the Amendment was put from the Chair and lost.

The original Resolution was then put from the Chair, and, after a few remarks from Sir RAYMOND JARVIS, Colonel LINDSAY, Captain GODBOLD, and Colonel SYKES, was carried.

The Chairman then announced that the business of the day was concluded.

(Signed) NORFOLK, E.M. Chairman.

B. BURGESS, Captain, Secretary.

Statement of Changes among the Members since 1st January, 1859:—

	Annual.		Life.		Total.
Number of Members on 1st January, 1859 .	2423	+	823	=	3246
Do. who have joined during 1859 .	176		19		195
	2599		842		3441
Changed from Annual to Life . . .	— 10		+ 10		
	2589		852		3441
Deduct—Deaths during 1859 . . 63		21			
Withdrawals . . . 13					
	76		21		97
Number of Members on 1st January, 1860 .	2513		831		3344

Tabular Analysis of the State of the Institution,

To the 31st of December, 1859.

Year. 1st Jan. to 31st Dec.	Annual Subs. received.	Entrance Fees.	Income (from all sources).*	Life Subs. received.	Amount of Stock.	Invested in the purchase of Books, &c.	No. of Vols. in Library.	No. of Members on the 31st Dec.	Number of Visitors.
	£	£	£	£	£	£			
1831	654	..	654	1,194	..	..	..	1,437	..
1832	1,146	..	1,146	973	..	..	..	2,699	..
1833	1,405	..	1,450	692	..	..	..	3,341	..
1834	1,500	..	1,549	583	1,100	..	..	3,748	13,376
1835	1,480	..	1,574	366	2,430	40	..	4,155	8,537
1836	1,570	..	1,682	330	3,747	45	..	4,069	8,521
1837	1,549	..	1,747	222	4,747	180	..	4,164	10,907
1838	1,462	..	1,634	230	5,500	246	..	4,175	15,788
1839	1,399	..	1,565	168	5,500	292	..	4,186	16,248
1840	1,363	..	1,525	198	5,500	446	5,500	4,257	17,120
1841	1,450	..	1,643	186	6,000	243	5,850	4,243	19,421
1842	1,373	..	1,565	144	6,400	373	6,450	4,127	21,552
1843	1,299	..	1,494	140	6,700	237	7,000	4,078	27,056
1844	1,274	..	1,408	112	3,000	298	7,850	3,968	22,767
1845	1,313	..	1,466	228	1,500	127	8,100	3,988	21,627
1846	1,298	..	1,456	138	1,500	74	8,410	4,031	32,885
1847	1,314	74	1,502	132	1,700	37	..	4,017	38,699
1848	1,175	57	1,375	48	1,700	85	9,641	3,947	37,140
1849	1,176	72	1,375	84	1,150	58	..	3,970	33,333
1850	1,141	106	1,294	198	600	36	..	3,998	33,773
1851	1,136	131	1,292	66	666	34	10,150	3,188	52,173
1852	1,134	133	1,281	114	200	43	10,300	3,078	20,609
1853	1,243	319	1,684	264	528	41	10,420	3,251	25,952
1854	1,200	138	1,368	126	612	95	10,587	3,171	22,661
1855	1,159	107	1,289	120	653	55	10,780	3,131	14,778
1856	1,216	197	1,519	156	761	47	10,832	3,204	16,184
1857	1,258	176	1,937	78	1,038	40	10,960	3,168	12,755
1858	1,318	221	2,102	105	438	31	11,062	3,246	25,747
1859	1,526	195	2,277	512	946	70	11,320	3,344	28,739

* Including Annual Subscriptions, Entrance Fees, Donations, Legacies, and Interest on Funded Property; and also the grant from Government, commencing in 1857.

LIST OF DONATIONS

From 1st January to 31st December, 1859.

	£	s.	d.
Wales, H.R.H. Prince of	20	0	0
Aitchison, *Sir* John, Gen. KCB.	2	0	0
Anderson, George, Surg.-Major	1	0	0
Atkinson, Francis B., *Esq.*	2	0	0
Barrell, Justinian, Capt. R.N.	0	10	0
Blair, W. F. Capt. R.N.	1	0	0
Blakeley, A. T. Capt. h.p. R.A.	0	10	0
Boileau, C. L. Major late R.B.	1	0	0
Carter, W. G., F.S.A., *Esq.* Sol. S. F. Gds.	1	1	0
Clinton, H. R. Ens. and Lieut. G. Gds	3	0	0
Cookes, Geo. Capt. late 3rd Lt. Drs.	5	0	0
Crawfurd, John, *Esq.*	5	0	0
Crozier, R. Rear-Adm.	0	10	0
Edward, Henry Rear-Adm.	1	0	0
Holden, Henry Lt.-Col. 13th Lt. Drs.	1	1	0
Jefferson, R. Capt. late Ceylon Rif.	1	0	0
King, R. H. Rear-Adm.	2	0	0
Lawrence, *Right Hon. Sir* John, Bart., GCB.	5	0	0
Lewis, Geo. G. Lieut. R.E.	1	0	0
Macdonald, Alex. Col. unatt.	1	1	0
Macleod, D. Major-Gen.	1	0	0
MacQueen, Jas. Capt. h.p. 3rd. Lt. Drs.	0	10	0
Carried forward £	56	3	0

	£	s.	d
Brought forward	56	3	0
Monro, D. A. Maj. late 12th Lns.	1	0	0
Moore, W. W. Col. late Ben. A.	1	0	0
Murray, P. K. Capt. G. Gds.	2	0	0
Narrien, John, *Esq.*	0	10	0
O'Grady, Hayes Vice-Adm.	2	0	0
Packe, Edmund Capt. late R.H. Gds.	1	0	0
Pakington, *Sir* John, KCB. First Lord of the Admiralty	5	0	0
Pollock, *Sir* Geo. Gen. GCB.	2	0	0
Rea, Edward Col. R.M.	1	0	0
Rhodes, Godfrey, Major unatt.	3	0	0
Rich, G. W. T. Lt.-Col. 71st Highland L. I.	2	0	0
Ripon, Earl of	2	0	0
Skey, Jno., M.D. Insp. Gen. of Hospitals	1	0	0
Sefton, Earl of	5	0	0
Stilwell, J. G. *Esq.* Navy Agent	2	0	0
Tyler, H. W. Capt. R.E.	4	5	0
Tyler, *Sir* James late Hon. Corps Gent.-at-Arms	12	15	0
Vyvyan, R. H. S. Lieut. Cornwall Rang.	1	1	0
Waddilove, C. L. Com. R.N.	2	0	0
Western, J. R. Col. Beng. Engs.	2	0	0
Wright, Charles Col. R.E.	5	0	0
Total . .	£113	14	0

LIST OF NEW MEMBERS

WHO JOINED THE INSTITUTION SINCE THE LAST EVENING MEETING IN 1859 (30TH MAY).

LIFE MEMBERS.

WALES, H.R.H. the Prince of.
Fitzgerald, H. C., Major 33rd Regt.
Breton, P. Wright, Capt. Hants. Mil.
Chambers, Montague, Lieut. h.p. 71st. Regt.
Godman, R. Temple, Capt. 5th Drag. Gds.
Cracroft, Peter, Capt. R.N.

ANNUAL SUBSCRIBERS.

Salwey, Alfred A., Com. Gen.
Oakley, Geo., Capt. 84th Regt.
Northey, E. R., Capt. late 52nd Regt.
Calderon, C. M., Cornet 4th Lt. Dgs.
Johnstone, Hon. H. Butler, M.P., Maj. Dumfries Mil.
Bulwer, E. G., CB., Lt.-Col. 23rd R. W. Fus.
Burrard, *Sir* Geo. *Bart.*, Dep. Lieut. Hants.
Robinson, *Sir* G. A. Maj. 22nd Regt.
Stacey, Wm. Jno. *Esq.*, War Office.
Strickland Edward A., Com. Gen.
Grimston, M. J., Capt. East York Mil.
Cairnes, Wm. Capt. 21st R. N. B. Fus.
Nelson, Thomas, Surgeon R.N.
Marillier, C. H., Ens. Cape M. Rifles.
Chichester, C. R., Maj. 97th Regt.
Fitzgerald, M., Lieut. 97th Regt.
Manners, A. C., Ens. 57th Regt.
Peyton, Francis, Lt.-Col. 98th Regt.
Wilkie, Jno. L., Capt. 12th Regt.
O'Brien, Wm. C., Capt. 73rd Regt.
Rochfort, Jno. de Burgh, Lieut. R.A.
Alston, A. H., Lieut. R.N.
Nuthall, W. F., Major 18th Beng. N. I.
Baring, D. H., Ens. & Lieut. C. Gds.
Lloyd, Fras. Thos., Lieut. R.A.
Graham, Fras. B., Forfar and Kincardine Mil. Art.
Wilson, R. S., Capt. 52nd Mad. N. I.
Noble, Jno. Geo., Capt. 1st Roy. Lan. Mil.
Webber, Geo., Lieut. R.N.
Bowles, R. F., Capt. late Roy. Berks Mil.
Seymour, L. R., Lieut Gren. Gds.
Forbes, Francis, Lt.-Col. ret. Mad. Cavalry.
Phibbs, Richd., Major 4th Roy. Lan. Mil.
Brown, Thos., Chief Engineer R.N.
Owen, C. Cunliffe, Capt. R.N.
Gibson, Chas. E., Capt. 49th Regt.
Clerk, John, Capt. Rifle Brigade.
Berger, Ernest A., Lieut. 10th Regt.
Ellesmere, *Earl* of, Lt.-Col. Lan. Yeo. Cav.
De Gruchy, W. L., Ens. 4th R. Jersey Mil.
Edgar, Josh. Haythorne, Lieut. R.A.
Bazalgette, S. A., Lieut. R.A.
Stopford, G. M., Major R.E.
Gordon, C. H., Capt., R.E.
Perceval, Jno. J., Lieut. 17th Regt.
Steward, Edwin A. T., Major 21st R. N. B. Fus.
Baker, T. D., Capt. 18th Royal Irish.
Bird, Edward, Capt. R.N.
Cook, Henry, Capt. 100th Regt.
Chapple, Edward, Lieut. 95th Regt.
Hartley, W. G., Capt. Roy. Denbigh Rifles.
McBean, Wm., Capt. 22d Regt.
Fyler, Jno. W. T., Lieut. 31st Regt.
Goodwin-Austen, H. H., Capt. 24th Regt.
Marsh, Augustus, Major late 55th Regt.
Prendergast, H. N. D., Lieut. Mad. Engrs.
Farrier, Jas., Quar.-Master Roy. Hosp. Chelsea.
Fairholme, Charles, Lieut. R.N.

Gibbs, Charles, Capt. 2nd Queen's.
Inglefield, J. H., Lieut. 38th Beng. N. I.
Brooke, Edw. T., Lieut. Royal Engrs.
Guildford, *Lord*, Capt. R.N.
Carey, Geo. Jackson, Col. Cape M. Rifles.
Nelson, Horatio, Com. R.N.
Steele, Aug. F., Lt.-Col. 9th Roy. Lancers.
Waite, F. J. S., Lieut. Fife Artillery.
Anderson, Wm., *CB.*, Col. (ret.) Beng. Art.
Baxter, Stafford Squire, Capt. 1st War. Mil.
Moorhead, C., Surgeon Bom. Establishment.
Field, E., Com. R.N.
Marvin, Wm., Major, Chief Paymaster Roy. Artillery.
Smyth, Henry, *CB.*, Col. 76th Regt.
Meaden, J., Capt. Ceylon Rifles.
Heathcote, J. A., Lieut. Indian Navy.
Chamberlain, *Sir* Henry O. R., Capt. Hon. Corps Gent.-at-Arms.
Tullibardine, Marquis of, Lieut. Sco. Fus. Gds.
Grover, G. E., Lieut. Royal Engineers.

ADDITIONS TO THE LIBRARY AND MUSEUM

SINCE THE 30TH MAY, 1859.

LIBRARY.—BOOKS.

(The Donors' Names in Italics.)

ACADEMY OF MILITARY SCIENCE, STOCKHOLM, 1 Vol. of the Publications of, for the year 1858. 1 No. of ditto for 1859. *The Swedish Government.*

ACHARD, AMEDEE. *Montebello — Magenta — Marignan.* Lettres d'Italie (Mai et Juin, 1859). Paris. 8vo. 1859. *John Barrow, Esq. F.R.S, &c.*

ARMSTRONG (Robert), on High Speed Steam Navigation and Steamship Perfection. Pamph. 8vo. London, 1859. *The Author.*

ART UNION OF LONDON. Twenty-third Annual Report of the Council, with list of Members. Six Almanacs—1860. *The Society.*

ASPLAND (Alfred) Esq. F.R.G.S. An Examination of the Report of the Commissioners to inquire into the Mortality of the Army. Pamph. 8vo. 1859. *The Author.*

BARNARD (J. G.) Major, U.S.A.

The Gyroscope. Pamph. 8vo. New York, 1858.

The Dangers and Defences of New York. 1859. *Captain Burgess.*

BARROW (John) Esq. F.R.S. Nos. 5, 6, 7, of Everybody's Journal, containing Papers on the Battle-fields of Italy in 1859. *The Author.*

BLUE BOOKS:

Report from His Majesty's Commissioners for inquiring into the system of Military Punishments in the Army. London, 1836.

Report relative to Military Affairs in Asiatic Turkey and the Defence and Capitulation of Kars. London, 1856. *Lt.-Col. J. G. Robinson.*

BRITISH ASSOCIATION for the Advancement of Science, Report of the Twenty-eighth Meeting of. Leeds, 1858. London. 8vo. 1859. *The Association.*

CATALOGUE OF MAPS, in the Library of the Topographical Department. Vols. I. and II. 1859.

Ditto, ditto, Additions to the Collection of Maps and Plans at the Topographical Depôt War Office to 31st October, 1852. 2 Sheets, 4to. *Secretary of State for War.*

CHARLESWORTH (E.) Esq. F.G.S. Remarks on Gun Accidents and on the Safety Elevator in the Construction of Fowling Pieces and Rifles. Pamph. 8vo. London, 1859. *The Author.*

COLES (Cooper P.) Capt. R.N. A cheap and simple mode of protecting our Mercantile Ports and Navigable Rivers. Pamph. 8vo. London, 1859. *The Author.*

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Journal of the Operations conducted by the Royal Engineers, from the Invasion of the Crimea to the close of the Winter Campaign, 1854-55. Part I. London, 8vo., 1859.

Part II., from February 1855 to the Fall of Sevastopol, September 1855. By Maj.-Gen. Sir H. D. Jones, R. E., K.C.B.

An account of the Artillery Operations conducted by the Royal Artillery and Naval Brigade before Sevastopol in 1854 and 1855. By Capt E. M. Reilly, R.A., C.B.

Secretary of State for War.

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The Author.

ESTE (M. L.) Esq. M.D. England in relation with other Countries' Revolutions and their Wars. Pamph. 8vo. 3 copies.
The Author.

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Jno. Barrow, Esq., F.R.S.

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GAZETTE (New Zealand Government). Extract from No. 23, of the 14th July, 1859, containing a Lecture on the Geology of the Province of Auckland, New Zealand. *W. Gibsone, Esq., under Colonial Secretary, Auckland.*

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Jno. Barrow, Esq., F.R.S., &c.

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The Author.

MALTON (W. D.) M.A., late Lieut. Royal Edmonton Rifles. Company and Battalion-drill, illustrated. 8vo. London, 1859. 2nd edition. *The Author.*

The A. B. C. of Skirmishing; being the Light Infantry Movements of a Company. Pamph. 12mo. London, 1859. *The Author.*

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MOULVEE MOHUMMUD MUSSEEHOOD-DEEN KHAN BAHADOOR. Oude, its Princes and its Government vindicated. 1 Vol. 8vo. London, 1857.

Dacoitee in Excelsis, or the Spoliation of Oude by the E. I. Company. 1 Vol. 8vo. London. *Captain Craven.*

NATIONAL LIFE BOAT INSTITUTION, Journal of. Vol. IV. Nos. 33, 34.
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NOLLOTH (M. S.) Captain R.N. Reminiscences of St. Domingo in 1849. Pamph. 8vo. *The Author.*

OWEN (Major) and DAMES (Capt.), R.A. Elementary Lectures on Artillery; prepared for the Use of the Gentlemen Cadets of the Royal Military Academy. 1 Vol. 8vo. Woolwich, 1859.
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PATENTS FOR INVENTIONS:

Abridgments of the Specification relating to Marine Propulsion. Parts 1, 2, 3.

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RAMCHUNDRA, late Teacher of Science, Delhi College. A Treatise on Problems of Maxima and Minima solved by Algebra. 1 Vol. 8vo. London, 1859. *Secretary of State for India.*

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Ditto, ditto, from page 1 to 120. Vol. II.

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G. B. Airey, Esq. M.A.

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Notices of the Proceedings at the Meeting of the Members. Part 9. Nov. 1858 to July 1859.

List of Members and Report of the Visitors for the Year 1858. *The Institution.*

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TURNER (Mr. George). Description and Observations on improved Military and other Tents, Marquees, &c. Pamph. London, 1858. 2 copies. French and English. *The Author.*

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Ditto, ditto, Part 1. Jan. to March, 1859.

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Major G. Rhodes, unattached.

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H. W. Hoskins, Esq.

Photograph of the Yacht "Fox."
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Lithograph of the Monument to the Officers of the 68th Regiment who died during the Russian war. Framed and glazed.
Lieut.-Col. Lewis, late 68th, in the name of the Regiment.

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MILITARY.

Specimen of his Elongated Shot on the expanding principle, taken from the expanding lotus pith base of Malay tube arrow or dart, and submitted to the Select Committee at Woolwich in the summer of 1823.

Elongated Rifle Shot with Wooden Wings for Rifled Ordnance.

2 Elongated Rifle Shells (new pattern).
Captain Norton.

The Arms, Accoutrements, Clothing, and Equipment of a Sardinian Grenadier, Bersaglieri, Cavalry, and Horse Artillery Soldier.
The Sardinian Government.

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The Belgian Government.

2 Cartridges invented by Dr. le Messurier, H. M. Madras Army.
The Inventor.

An American Volcanic Repeating Pistol, with Cartridges. *E. Haslewood. Esq.*

Model of Rhodes's Hospital Tent.
Ditto Ditto Field Tent.
Major G. Rhodes, unattached.

1 Bow and 4 Arrows.
2 Long Spears.
5 Short Spears.
3 Dirks in sheaths.
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1 Stick and Ball at the end.
1 Shield.
2 Battle Axes.
From Central Africa, brought home by Capts. Burton and Speke.
The Royal Geographical Society.

Sword picked up on the field after the action at Jellalabad.

Affghan Sword brought from Affghanistan, by the late Major Fenwick, 13th Light Infantry.

Shield found after the capture of Ghuznee, by the late Major Fenwick, 13th Light Infantry.
Mrs. Fenwick.

Matchlock and Sword (two small bells attached to the hilt) from Borneo.
Captain E. G. Fishbourne, R.N., C.B.

NAVAL.

Model of a Gun-boat.
H. G. the Duke of Northumberland.

Model of a Man of War, put together in a glass bottle by a French prisoner in Norman Cross Prison in 1810.
Com. R. M. Cole, R.N.

MISCELLANEOUS.

Specimen of Iron from a 68-pr. gun burst in second round of proof, showing the grain.

Specimen of Metal from Cascable of a 6-pounder gun cast at the Royal Gun Factories, Woolwich.
Lieut.-Col. E. Wilmot, R.A.

Wooden Sight for correcting the dispart of a gun, found in one of the batteries captured in the Canton Expedition, 1847. *Sir John F. Davies, Bart. K.C.B.*

Arab Stirrups, Bit, Pouch, Belts, and Water-bottle, embroidered.
Captain A. C. Tupper.

1 Umbrella and Spear, 1 Boat-flag, 2 pairs of Stirrup-irons, 1 Double Bridle-bit, 1 Flat piece of Iron. From Central Africa. Brought home by Captains Burton and Speke.
Royal Geographical Society.

Three Leathern Bags, which contained the Dispatches of the Battles of Alma and Inkerman and Capture of Sevastopol.
Mr. E. Kiddle, War Department.

Two specimens of Antimonial Copper from the Wheal Anna Maria Mine at Port Navis, Cornwall.
Geo. A. Copeland, Esq.

A curious Blade Chain-Shot used by the Rebels in India at the Capture of the City of Kotah in Rajpootana, on the 30th March, 1858.
Colonel J. C. Raines, 95th Regt. C.B.

Package of Cartridges made at Lucknow by Col. North, 60th Rifles.
Colonel North.

Live Shell, supposed to have been thrown from one of the new French rifle cannon at the Battle of Solferino, brought from the field by J. B. Herbert, Esq.
J. B. Herbert, Esq.

1 Bullet, 1 Cartridge, from the battle-field of Solferino.
John Barrow. Esq. F.R.S. &c.

A Box to hold the signal-book of the Chesapeake, made from the timbers of H. M. Ship Shannon, now being broken up at Chatham.
Capt. G. Goldsmith, R.N., C.B.

A Hoof of "Jock," the last surviving horse of the 2d Life Guards, present at the Battle of Waterloo in 1815. Shot and buried in Hyde Park, 29th June, 1836. *Lieut.-Col. G. F. Paschal.*

2 Small Gold Boats, attached to the ribbon of the Medal granted to the late Sir William Hillary, Bart. See Journal, Vol. III. page 226.

No. 1. Voted January 16, 1828, in acknowledgment of his gallant services in putting off in a shore-boat and assisting to rescue the crew of eleven men and five Manx sailors from the Swedish ship Fortroindert, which was wrecked off Douglas, Isle of Man, during a heavy gale of wind, on the 10th December, 1827.

No. 2. Voted January 27, 1836, in testimony of his intrepid services in putting off in the Douglas lifeboat and rescuing seven men from the sloop Eclipse, which was wrecked in Douglas Bay, during a very heavy gale of wind, on the 14th January, 1830.
Walter Hawkins, Esq. F.S.A.

Form of Bequest.

I give and bequeath unto THE ROYAL UNITED SERVICE INSTITUTION, *situated in Whitehall Yard, London, the sum of*

to be applied in and towards carrying on the designs of the said Institution, such Legacy to be paid out of such part of my Personal Estate not specifically bequeathed as the law permits to be appropriated by Will to Charitable Purposes.

ROYAL UNITED SERVICE INSTITUTION.

DESIGN.

The promotion of Naval and Military Art, Science, and Literature, is the object of the ROYAL UNITED SERVICE INSTITUTION.

The principal means by which this object is sought to be attained are, —the formation of a Library containing Historical, Scientific, and Professional Works, Maps, Charts, and Plans ; the delivery of Lectures ; the exhibition of Inventions ; and the publication of a Journal ; a collection of Arms of all Nations ; and a Museum, which shall serve as a Central Repository for objects of Professional Information, and for Trophies and Relics, &c., connected with distinguished Officers, and Naval and Military operations.

BYE LAWS.

SECTION I.

1. There shall be Patrons and Vice-Patrons.
2. PATRONS: The Sovereign and the Royal Consort.
3. VICE-PATRONS: limited to Members of the Royal Family; Officers eminently distinguished in the Service of the Country; and Members selected by the Council as having been benefactors to the Institution.
4. The following public Officers shall be Vice-Patrons during their continuance in office:—

1. The First Lord of the Treasury.
2. The Secretary of State for the Home Department.
3. The Secretary of State for Foreign Affairs.
4. The Secretary of State for the Colonies.
5. The Secretary of State for War.
6. The Secretary of State for India.
7. The First Lord of the Admiralty.
8. The Commander-in-Chief of Her Majesty's Forces.
9. The Lord-Lieutenant of Ireland.

SECTION II.—COMPOSITION.

1. Princes of the Blood-Royal; Lords Lieutenant of Counties; Governors of Colonies and Dependencies; Officers of the Army, Navy, Marines, Her Majesty's East Indian Military and Naval Forces, Militia, Yeomanry, and Volunteer Corps, shall be entitled to become Members *without Ballot*, on payment of the Entrance Fee and Annual Subscription.

2. Retired Officers, not previously Members; Deputy Lieutenants of Counties; Civil Functionaries who are or have been attached to the Naval and Military Departments; and Navy and Army Agents; shall be *eligible* to become Members by *Ballot.*

3. Gentlemen above the age of *fifteen,* whose names are on the list of the Commander-in-Chief for Commissions in the Army, or who are probationary for offices connected with the Naval and Military Professions, shall be *admissible,* by *Ballot,* to become PROVISIONAL MEMBERS from year to year, on payment of the Annual Subscription; after they obtain their appointments they shall become ordinary Members on payment of the Entrance Fee.

4. The Candidates referred to in Articles 2 and 3 must be recommended by two Members of the Institution on their personal knowledge; the Lists signed by the Secretary shall be put up in the Library or Reading Room, fourteen days before they are submitted for election to the Council of Management specially assembled.

SECTION III.—GOVERNMENT.

1. The Government shall consist of a President and twelve Vice-Presidents; and a Council of Management composed of twenty-four Members.

2. THE PRESIDENT OF THE INSTITUTION shall be elected by a General Meeting of the Members, and shall be a Member of the Council, *ex officio.*

3. THE VICE-PRESIDENTS shall be elected by the Council, of which they shall be *ex-officio* Members.

4. THE COUNCIL shall be elected by the General Meeting : Eight Members shall annually go out by rotation; three of the Members going out shall be eligible to be re-elected. The Council shall submit to the Annual General Meeting a list of not less than ten names from which the vacancies may be filled. Vacancies that occur during the year shall be filled up at the discretion of the Council ; the Members so elected going out by rotation as the Members would have done whose position they have been elected to fill.

5. After the Annual Meeting, the Council shall select a Chairman and Vice-Chairman for the ensuing year, one of whom, or a Vice-President, shall preside at its Meetings, except when the President of the Institution attends.

6. Five Members of the Council shall constitute a Quorum.

7. Two Vice-Presidents shall undertake the office of Visitors, who shall make a quarterly inspection of the Institution and its affairs, and report thereon to the Council.

8. The Council, shall have the custody of the Common Seal of the Corporation, and shall have full power and authority to affix the same to all deeds, documents, papers, and writings in the name and on behalf of the Corporation.

9. The Council shall appoint a Secretary and Curator, and such other officers, attendants, and servants, as they shall think necessary for the purposes of the Institution, with full power to suspend or dismiss the same,

and no such officer, attendant, or servant shall, either directly or indirectly, accept, receive, or take, from any person or persons whatsoever, any gratuity, fee, or reward whatsoever, other than and except the salary, wages, or emolument allowed by the Council.

SECTION IV.—Subscription.

1. *An Entrance* Fee of *One Pound* shall be paid by all Members on joining the Institution.

2. *Annual Subscriptions* shall be due on the 1st of January in each year: Subscribers of not less than *One Pound* a-year, shall, after the 1st of January, 1860, be entitled to receive the Journal from the date of their becoming Members.

3. Annual Subscribers of *Ten Shillings*, shall, after the 1st of January, 1860, receive as heretofore the Annual Report, but not the Journal.

4. After the 1st of January, 1860, all Subscribers of One Pound a-year shall, while serving on Foreign Stations, have their Subscription reduced to *Ten Shillings* a-year, commencing on the 1st of January succeeding their embarcation, if they express their wish to that effect in writing to the Secretary.

5. *Life Subscriptions.* After the 1st of January, 1860, the payment of a sum of *Nine Pounds*, in addition to the Entrance Fee, shall constitute a Member for Life, who shall be entitled to receive the Journal from the time of his becoming a Member.

6. *Life Subscribers* of *Six Pounds*, in addition to the Entrance Fee, shall receive as heretofore the Annual Report, but not the Journal.

7. Annual Subscribers of Ten Shillings and Life Subscribers of Six Pounds, while serving abroad, shall be entitled during such service to receive the current numbers of the Journal, on notifying their wish to that effect to the Secretary in writing.

8. Members who join the Institution on or after the 1st October in any year shall not be charged the ensuing Annual Subscription on the 1st of January.

9. Members failing to pay their Annual Subscriptions shall have their names removed from the List of Members, at the discretion of the Council.

10. Members whose names have been struck off for non-payment of their Subscriptions after repeated applications, shall be re-admissible only on payment of arrears from the date of last payment.

SECTION V.—Funds and Expenditure.

1. The management of the property, receipts, and payments of the Institution shall be confided to the Council, who shall authorise every payment by an order, signed by the Chairman at the Meeting, and another Member of Council present, and countersigned by the Secretary.

2. The Royal United Service Institution neither shall nor may make any dividend, gift, division, or bonus in money, unto or between any of its

Members out of its present property, or out of any property which it may hereafter acquire, and the whole of its property, both present and future, shall be exclusively applied for carrying into effect its design as an establishment for the promotion of Naval and Military Art, Science, and Literature.

3. The funds of the Institution and all Life Subscriptions and Legacies, shall be invested in eligible securities, in the names of Trustees, selected by the Council, with the approbation and concurrence of a General Meeting.

4. All cash received on behalf of the Institution by the Secretary shall be paid by him to the Bankers of the Institution.

SECTION VI.—Auditors.

1. There shall be three Auditors, not Members of the Council, who shall be elected by the General Annual Meeting to audit the accounts, one of whom shall annually go out by rotation, but shall be eligible for re-election.

2. Two Auditors shall be a quorum.

3. Vacancies that occur other than those caused by the Auditor going out by rotation shall be filled up at the discretion of the Council; the Auditor so elected, going out in rotation as the Auditor would have done whose position he has been elected to fill.

4. The Auditors shall meet and examine and sign the yearly accounts, adding thereto any remarks, and making such inquiries as they may deem proper.

5. After the Audit, and at least fourteen days before the General Annual Meeting, the Annual Report, with an abstract of the accounts, and estimate of the probable expense for the ensuing year, shall be printed, and circulated among the Members.

SECTION VII.—General Meetings.

1. A General Meeting shall be annually held on the first Saturday in March; that day being considered the Anniversary of the Institution.

2. The Council may call a Special General Meeting on giving fourteen days' notice—which notice must be suspended in the Library or Reading Room, and advertised in two military papers, specifying the object or objects in contemplation, and explicitly stating that the discussion shall be strictly confined to those objects.

3. The Council shall call a Special General Meeting, on the written requisition of not less than Twenty-four Members, within one calendar month from the date of such requisition, subject to the notices and restrictions above-mentioned.

4. At the General Meetings, in case of an equality of votes, the Chairman shall have a second or casting vote.

5 No Member shall be entitled to speak or vote at any General Meet-

ing, or at any Special General Meeting, or at any adjournment thereof, unless he shall have paid his subscriptions up to the day of payment next preceding such Meeting.

6. That any General or Special General Meeting, finding the current day insufficient for its intended purpose, may adjourn to the succeeding or any future day or days, until the business be concluded.

7. That no business shall be transacted at any Annual General Meeting other than that submitted by the Council, or by the direction of the Council, unless notice thereof be suspended in the Library or Reading Room at least fourteen days prior to the day appointed for such Annual General Meeting, specifying the object or objects in contemplation, to which objects the discussion must be strictly confined.

SECTION VIII.—Making or Repealing Bye Laws.

Should it be proposed to make or repeal a Bye Law, the proposition to such effect, signed by the proposer and seconder, shall be suspended in the Library or Reading Room for fourteen days; after which the question shall be determined by a majority of at least two-thirds of the Members present at the next General Meeting.

SECTION IX.—Mode of Voting.

All questions to be decided by a show of hands, unless a Ballot be demanded.

SECTION X.—Honorary Members.

1. The Council shall have the power of admitting Honorary and Corresponding Members.

2. Foreigners of Distinction may be admitted as Honorary and Corresponding Members.

3. Eminent Individuals and Benefactors to the Institution, not otherwise eligible, may be admitted as Honorary Members.

4. The Diplomatic Body shall be invited to become Honorary Members; and shall be privileged to submit the names of foreign noblemen and gentlemen, resident in England, to the Council, in order that the same courtesy may be extended to them, for the space of Three Months: this privilege to be renewed to such strangers, if desired, on the written application of their respective Ambassadors, or at the recommendation of some Member to whom they may be personally known.

5. Foreign Naval and Military Officers may be admitted as Honorary and Corresponding Members.

6. Ladies, who contribute to the Institution, may be admitted as Honorary Members.

SECTION XI.—Contributions.

The name of each Contributor shall be recorded, with a specification of the gift.

SECTION XII.—Hours of Reception—Visitors.

1. The Museum of the Institution shall be open daily (Sundays excepted) from 11 to 5 in Summer, and from 11 to 4 in Winter.* Printed tickets for the admission of visitors are available every day except Friday, on which day, a personal introduction by a Member is necessary. The names of Visitors to be inscribed in a book kept for the purpose.

2. The Libraries and Reading Rooms shall be kept open (Sundays excepted) for the use of Members only, till eight in the evening, or to a later hour, at the discretion of the Council.

3. The Museum shall be closed to Visitors when necessary, at the discretion of the Council.

SECTION XIII.—Expulsion.

1. Any Member who shall be removed from the Public Service for causes affecting his character shall cease to belong to the Institution.

2. In case the Council should think it expedient to submit the conduct of any Member to the judgment of a General Meeting, the Council shall call a Special General Meeting; and in the event of its being voted at that Meeting, by two-thirds of the Members present (to be decided by ballot), that such Member should be removed from the Institution, then, in that case, the name of such Member shall accordingly be erased from the list of Members, and he shall cease to belong to the Institution.

3. In case the Member is a Life Subscriber, he shall forfeit all claim on the Institution upon his expulsion.

* Winter months—October to March inclusive.

ROYAL
UNITED SERVICE INSTITUTION.

Charter of Incorporation.

Victoria by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith, **To all to whom** these presents shall come, **Greeting**:

Whereas our right trusty and right entirely beloved Cousin and Councillor, Algernon Percy, Duke of Northumberland, Knight of the Most Noble Order of the Garter, Vice-Admiral, and others of our loving subjects, have, by their Petition, humbly represented unto us that they are Members of a Society, established in the year one thousand eight hundred and thirty-one, under the title of "The Naval and Military Library and Museum," but since called "The United Service Institution," of which His late Majesty King William the Fourth was the founder;

That such Society has sedulously encouraged

and extended Naval and Military Science and Literature, and that it would further tend to the promotion and advancement of Naval and Military Science and Literature if we granted to the said Algernon Percy, Duke of Northumberland, and to those who are now Members of the said Society, our Royal Charter of Incorporation;

Now know ye, That We, being desirous of encouraging a design so laudable and salutary, of our especial grace, certain knowledge, and mere motion, **Have** willed, granted, and declared, and **Do** by these presents, for Us, our heirs and successors, will, grant, and declare, that the said Algernon Percy, Duke of Northumberland, and such other of our loving subjects as now are Members of the said Society, or shall from time to time become Members thereof, according to such regulations or bye-laws as shall be hereafter framed or enacted, and their successors, shall, during such time as they shall respectively continue to be such Members, be by virtue of these presents one body politic and corporate, by the name of "THE ROYAL UNITED SERVICE INSTITUTION," and for the purposes aforesaid and by the name aforesaid shall have perpetual succession and a common seal, with full power and authority to alter, vary, break, and renew the same at their discretion, and by the same name to sue

and be sued, implead and be impleaded, answer and be answered unto, in every court of Us, our heirs and successors, and be for ever able and capable in the law to purchase, receive, possess, hold, and enjoy, to them and their successors, any goods and chattels whatsoever, and as well those as now belong to the said Institution as those which may be hereafter acquired; and also to be able and capable in the law (notwithstanding the Statute of Mortmain) to take, purchase, hold, and enjoy to them and their successors a Hall or House, and any such messuages, lands, tenements, or hereditaments whatsoever as may be necessary for carrying out the purposes of the said Society, the yearly value of which, including the site of the said hall or house, shall not exceed in the whole the sum of two thousand pounds, computing the same respectively at the rack-rent which might have been gotten for the same respectively at the time of the purchase or acquisition thereof; and to act in all the concerns of the said body politic and corporate as effectually, to all intents and purposes, as any other of our liege subjects in our said kingdom not being under any disability might do in their respective concerns.

And We DO HEREBY GRANT our especial licence and authority unto all and every person and persons,

bodies politic and corporate, otherwise competent, to grant, sell, alien, and convey in mortmain unto and to the said body politic and corporate and their successors, any messuages, lands, tenements, and hereditaments, not exceeding such annual value as aforesaid.

And Our will AND PLEASURE IS, and we do further will and declare, that there shall be Patrons and Vice-Patrons, and a President and Vice-Presidents, of the said Institution, and that the said Algernon Percy, Duke of Northumberland, shall be the first President under this our Royal Charter of Incorporation, and that not more than Twenty-four nor less than Twelve Members, to be chosen by a General Meeting of the said Society, shall be the Council of the said body politic and corporate, of which the aforesaid President and Vice-Presidents shall be ex-officio Members; and, until such Members of the Council shall be elected, the present Members of the Council of the said Institution shall be the Council of the said body politic and corporate.

And We DO FURTHER WILL AND DECLARE, That there shall be a General Meeting of the Members of the said Society once in each year or oftener, and that if necessary the same shall be adjourned from time to time, and that the said General Meetings and the Council shall have the entire direction and manage-

ment of the concerns of the said body politic and corporate, in the manner and subject to the regulations hereinafter mentioned.

And We DO FURTHER WILL AND DECLARE, That the said General Meetings shall from time to time make and establish such bye-laws, and vary, and alter, and revoke the same, as they shall deem to be useful and necessary, for the election of President, Vice-Presidents, and Council, and for the regulation of the said body politic and corporate, for the admission and expulsion of Members and of honorary and foreign Members, so that such bye-laws be not repugnant to these presents, or to the laws and statutes of this our realm; and shall and may also enter into any resolution and make any regulation respecting the affairs of the said body politic and corporate that may be necessary and proper, and shall not be repugnant to these presents, or to the said laws and statutes.

And We DO FURTHER WILL AND DECLARE, That the General Meetings and adjourned General Meetings shall take place at such time as may be fixed by the said Council, and that the present rules, regulations, or bye-laws of the said Society, so far as they are not inconsistent with these presents, shall continue in force until the same shall be altered by a General Meeting.

And We DO FURTHER WILL AND DECLARE, That, notwithstanding anything herein contained, the Council shall have the sole management of the income and funds of the said body politic and corporate, the appointment of Secretary, Curator, and such officers, attendants, and servants as the Council shall think necessary or useful; and also the entire management and superintendence of all the other affairs of the said Society; and shall and may, but not inconsistently with or contrary to the provisions of this our Charter, or any existing bye-law or laws, or the laws and statutes of this our realm, do all such acts and deeds as shall appear to them necessary for carrying into effect the objects and views of the said body politic and corporate.

Provided always, and we do further will and declare, That the Council shall from time to time, and at least once in each year, render to a General Meeting a full account of their proceedings, and that every Member of the Society may at all reasonable times, to be fixed by the Council, see and examine the accounts of the receipts and payments of the said body politic and corporate.

And We DO FURTHER WILL AND DECLARE, That no sale, mortgage, incumbrance, or other disposition of any messuages, lands, tenements, or hereditaments belonging to the said body politic and

corporate shall be made, except with the approbation and concurrence of a General Meeting.

And We DO FURTHER WILL AND DECLARE, That it shall be lawful for the Council of the said Institution, with the approbation and concurrence of a General Meeting, from time to time to appoint any persons to be Trustees of any part of the property of the said body politic and corporate, and to make, or direct to be made, any conveyance or transfer to such Trustees.

In witness whereof we have caused these our Letters to be made Patent.

Witness Ourself, at Our Palace at Westminster, this twenty-second day of February, in the twenty-third year of our reign.

By Her Majesty's command,

Edmunds.

Seal.